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GEOPHYSICAL ABSTRACTS 117

APRIL-JUNE 1944

COMPILED BY

W. AYVAZOGLOU AND V. SKITSKY

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GEOPHYSICAL ABSTRACTS 117
APRIL - JUNE 1944[1]

Compiled by W. Ayvazoglou[2] and V. Skitsky[2]

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FOREWORD

Geophysical Abstracts 1 - 86 were issued in mimeographed form by the Bureau of Mines; Abstracts 87 - 111 were published in bulletins of the Geological Survey; Abstracts 112 - 116 were issued in mimeographed form by the Bureau of Mines as Information Circulars 7256, 7257, 7267, 7273 and 7285.

1. GRAVITATIONAL METHODS

7380. Dryden, H. L. A reexamination of the Potsdam Absolute Determination of Gravity. Jour. Research Nat. Bureau of Standards, vol. 29, No. 5, 1942, pp. 303-314.

Recent absolute determinations of the acceleration of gravity differ from the generally accepted Potsdam value by amounts considerably greater than the probable error assigned to that value by the Potsdam investigators. The discrepancy is due in large part to an adjustment made with the intent of correcting for certain systematic errors. The adjustment was probably not warranted. If this adjustment is not made, the Potsdam result is

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[2] Physical science analytical editor, Bureau of Mines, U. S. Department of the Interior.

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about 12 parts per million less than the commonly accepted value as compared with 14 and 20 parts per million less as found in the recent absolute determinations. The best value of G for general use when accurate absolute values are needed is probably obtained by reducing the local value in the Potsdam system by about 15 parts per million. The Subcommitte on Gravity of the National Research Council Committee on Fundamental Physical Constants has recommended a reduction of 17 parts per million. - Author's abstract.

7381. Duerksen, J. A. Gravity-Anomalies and Meridian Deflections in Hawaii. Nat. Research Council, Am. Geophys. Union, Trans. 1943, part I, Washington, D. C., 1943, pp. 34-39.

Positive gravity anomalies and isostatic deflections in the meridian indicate that the Hawaiian Islands are not isostatically compensated. The present investigation seeks to determine from gravity data, upon the basis of estimates of the islands' density, the increase in the density of the subwater part of the islands necessary for reducing the average gravity anomaly to zero; this increase is then used to determine the new meridian deflections. The investigation deals with the Islands of Hawaii and Oahu possessing the largest number of gravity and latitude determinations. In the computation of isostatic effects a distinction is made between an "island-block" extending from the ocean-floor to the island's surface, and a "compensation-block" standing directly beneath the island-block to a depth of 113.7 km. below the ocean-floor. At first, three anomalies are computed for each gravity-observation; The free air, Hayford-Bowie isostatic, and a special anomaly. Next, the increase of density of the compensation-block, above normal, is calculated from the first two positive anomalies separately for each station. Finally, Hayford isostatic deflections of the vertical in the meridian are computed for each one of the latitude-stations. The special deflections are calculated by using the increase of density of the compensation-block for each island separately. The results lead the author to conclude that the Island of Hawaii is an extra load on the earth's crust, while the Island of Oahu is partly compensated. The deflections of the vertical in the meridan are decreased very considerably, particularly for Hawaii; they corroborate the gravity results in a general way. - V. S.

7382. Hammer, Sigmund. Estimating Ore Masses in Gravity Prospecting (A.S.P.G. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, p. 109.

In gravity surveys for oil, the size and depth of structures associated with anomalies are the main interpretative factors. On the other hand, in gravity surveys for ore, the mass of the ore body is important. This difference in interpretation has received scant attention in geophysical literature. Yet mathematical physicists recognize that there is a certain uniqueness in the determination of the magnitude of the mass anomaly from the observed gravity anomaly. The anomalous mass is here calculated by the surface integral of the product of area and relief of the gravity anomaly which it causes. This distinction must be clearly recognized. - V.

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7383. Jeffreys, Harold. The Stress-Differences in the Earth'S Shell. Monthly Notices of the Royal Astronomical Soc., Geophys. Suppl., London, vol. 5, No. 3, 1943, pp. 71-89.

The stress-differences needed to support given surface loads due to harmonics of degrees 2 and 3 have been estimated on four hypotheses: (1) Elastic loading of a uniform sphere; (2) inelastic loading of a uniform sphere, with continuous stress at the center; (3) and (4) inelastic loading of a sphere with no stress-differences within distances 0.545a and 0.9a of the centre, "a" being the radius. Mean stress-differences are also found on hypotheses (3) and (4) for loading due to harmonics of degrees 10 and 30. Combining the results with the observed distribution of gravity, it is found that the strengths needed on hypothesis (3) are about 150×10^6 dynes/cm.^{2} at depths down to about 0.1 of the radius and about 80×10^6 dynes/cm.^{2} down to the core. On hypothesis (2) strengths of about 330×10^6 dynes/cm.^{2} are needed throughout the outer tenth of the radius. The uncertainty of the coefficient of P_2 in gravity found from the precessional constant by de Sitter's method is estimated from the variation of gravity in other harmonics not consistent with the hydrostatic state. It is found to be 5.9 milligals virtually based on four degrees of freedom. - Author's abstract.

7384. Lockenvitz, A. E. The Periodic Variations of the Gravitational Force. I. Geophysics, Menasha, Wis., vol. 9, No. 1, 1944, pp. 94-105.

The expression for the variation of the gravitational field, at a particular place on the earth's surface, due to a tide producing body is put into a form which does not neglect terms or factors which will produce changes in the gravitational field of as much as 0.001 milligal. A method of carrying out routine calculations by means of a series of graphs is described. - Author's abstract. (See also Geophys. Abs. 116, No. 7263).

7385. Mikhailov, A. A. Gravity Surveying in the U.S.S.R. (in Russian). Internat. Geol. Congress, Rept. of 17th Sess., Moscow-Leningrad, 1937, vol. 4, Moscow, 1940, pp. 427-430.

Prior to 1932 gravity surveying was carried on in Russia without road planning. In 1932 a Government decree authorized the Main Office of State Surveying and Cartography to make a general gravimetric survey of the entire territory of the U.S.S.R., with a mean density of one gravity station to every 1,000 km. This work is designed to meet the demands of geophysics, geology, and geodesy. The progress of the survey is indicated by the growing numbers of stations established annually on land and at sea: 1923 - 29; 1928 - 136; 1932 - 768; 1936 - 1,759. At present the European part of the U.S.S.R. and some districts in Asiatic U.S.S.R. are covered with gravity stations of standard density. - V. S.

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7386. Miller, B. L. Specific Data on the So-Called "Reading Overthrust". Bull. Geol. Soc. America, Baltimore, Md., vol. 55, No. 2, 1944, pp. 211-245.

In 1934 Stose and Jonas proposed the hypothesis that much of the crystalline rock and Hardyston mass in the area west of Reading is a great overthrust sheet. The older rocks here do not pass under the younger valley rocks in a normal folded sequence but overlie them in a tectonic series in which the position of the members is due to overthrusting. In testing this hypothesis, the author examined several types of field evidence. A part of the evidence was gravimetric; it was supplied by the measurements of the United States Coast and Geodetic Survey in the Bethlehem region in 1935, as well as by the work of Woollard in 1939, Hersey in 1941, and Nettleton in 1941. This gravimetric material is studied now with respect to various aspects of the overthrust problem. The author concludes from the total evidence that the overthrust hypothesis is not supported. - V. S.

7387. Peoples, J. W., Wells, F. G., Thayer, T. P., and Howland, A. L. Geologic Principles in the Search for Chromite Ore (Abs.). Econ. Geol., Lancaster, Pa., vol. 38, No. 1, 1943, pp. 81-82.

Since 1939 the United States Geological Survey has investigated many of the known chromite deposits in the Western Hemisphere, including all the principal mines in Alaska, the United States, Brazil, Cuba, Guatemala, and Mexico. Two principal types of deposits have been recognized - stratiform and sackform. Some conditions of their occurrence and guides for prospecting are indicated. Geophysical prospecting by gravimeter and magnetometer, directly or indirectly have been moderately successful in certain situations, but are subject to severe limitations. - Condensed by V. S.

7388. Rey, P., and Oks, M. Coordinación de métodos geofísicos (Coordination of Geophysical Methods). Bol. Inform. Petrol. (YPF), Buenos Aires, vol. 20, No. 230, 1943, pp. 3-15.

The Department of Exploration of the Argentine Y.P.F. (Administration of Government Oil Fields) made geophysical surveys in the Provinces of Chaco, Slata, Mendoza, Neuquen, etc. The application of various methods was guided by available information and respective costs. The gravimetric method, supplemented by the seismic method, was found to be most suitable for local problems; approximate costs are given. The causes of gravimetric anomalies were judged to be the structure of formations (pointing to oil), the position of planes of discontinuity, the location of the basement, lateral variations in the density of formations, and the influence of surface irregularities. The results of exploration have shown that the application of geophysics in Argentina is eminently satisfactory. Numerous geophysical maps are appended. - V. S.

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7389. Shneerson, B. L. The Gravitational Anomalies in the Ishimbaev District (in Russian). Compt. rend. (Doklady) Acad. Sci. l'U.R.S.S., Moscow, new ser., vol. 29, Nos. 5-6, 1940, pp. 390-393.

Gravitational anomalies are correlated with the presence of salt deposits and anhydrite lenses in the Artinskian (Permian) limestone. Deep wells permit direct comparison of the geology with the anomalies. - Annotated Bibliography of Economic Geology for 1942, vol. 15, no. 1, 1943, p. 124.

2. MAGNETIC METHODS

7390. Bronstein, K. G. The Kursk Magnetic Anomaly (in Russian). Internat. Geol. Cong., Rept. of 17th Sess., Moscow-Leningrad, 1937, vol. 4, Moscow, 1940, pp. 181-199.

The Kursk magnetic anomaly was first observed in the 18th century, but the quartzite and iron ore deposits were discovered in 1924-31. Now 14 ridges are known in the Kursk and Kharkov regions. The total area explored magnetically approximates 88,000 sq. km.; gravimetrically, 12,400 sq. km.; and seismically, 5,000 sq. km. In the course of this work, a combined geophysical method was developed which has yielded new dicoveries. The Shchigry and Korobkovo-Lebedi districts are estimated to hold 200,000,000 tons of ore. The total reserve of quartzite ores known so far amounts to hundreds of billions of tons. Still, only part of the region is geophysically surveyed. The author praises highly the combined use of magnetic, gravitational, and seismic principles. The field work in the surveyed area is accompanied by theoretical studies of the causes of the magnetic property of quartzite, telluric currents, etc. Now light may be expected on a number of geophysical and geological problems. - V. S.

7391. Coast and Geodetic Survey, U. S. Department of Commerce. Uses of Magnetic Stations, Spec. Pub. 213, Washington, D. C., 1943, 7 pp.

A variety of information is supplied for magnetic exploration: (1) Description of the compass and early surveys of the United States. (2) Definitions of such phenomena as magnetic declination, secular and annual changes, diurnal variation, magnetic storm, local disturbance, and compass correction. (3) Compass surveys and the true meridian; the best method of referring the compass bearings to a true meridian is by observations of the Polaris or of the sun; otherwise it is necessary to maintain a true meridian line and to determine the magnetic declination; as a last resort, the secular change data may be used. (4) Magnetic survey of the United States by the Coast and Geodetic Survey made at county seats and other places. (5) Description of magnetic observatories at Cheltenham, Md.; Honolulu, Hawaii; San Juan, P. R.; Sitka, Alaska; and Tucson, Ariz. (6) Bibliography on the use of the compass. - V. S.

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7392. Dubief, J. Resultats des mesures magnétiques au Sahara (Results of Magnetic Measurements in Sahara). Trav. Inst. Mét. et Phys. Globe de l'Algérie, Alger, No. 1, 1943, pp. 1-15.

Contains results of magnetic measurements at 85 stations made from October 1940 to December 1942, together with brief descriptions of the stations. - Terrestrial Magnetism and Atmospheric Electricity, vol. 48, No. 4, 1943, p. 254.

7393. Fleming, J. A. Geomagnetism in Latin America. Proc. of 8th Am. Sci. Cong., 1940, Washington, D. C. vol. 7, Physical and Chemical Sciences, 1942, pp. 47-56.

Geomagnetism is a study of the magnetic and electric fields of the earth. An outline is presented of such studies in Latin America. Intensive work was begun in 1905 by the Carnegie Institution of Washington, in the course of its world magnetic survey on land and sea. At present, there are 15 permanent magnetic observatories in the Americas, of which 8 are in Latin America; 2 more observatories are desirable, in Brazil and Chile. Particularly important is the Huancayo Observatory in Peru, near the magnetic equator; it carries on observations of solar radiation, the magnetic influence of the moon, and the ionosphere. In Bermuda and Guatemala special investigations are made of the effect of unusual geological features on the magnetic field. The various problems investigated in Latin America are briefly discussed. - V. S.

7394. Fleming, J. A. The Sun and the Earth's Magnetic Field. Ann. Rept. Smithsonian Institution, 1942, Washington, pp. 173-208.

The sun affects the earth's magnetism through the outer atmosphere. This relationship affords data for the study both of magnetic and solar phenomena. The author at first deals with sun-spots and other solar characteristics. He then describes the earth's magnetic field with respect to time changes of a regular and irregular type, magnetic activity and its measurement, various indices, magnetic disturbances of various extent, influence of the sun's radiations, relation to sun-spots, epoch-methods, etc.; most questions are treated in their historical perspective. The related subjects under discussion are ionospheric and solar relations, earth currents, recent geomagnetic and auroral disturbances, cosmic-ray relations, and the laboratory approach. A bibliography is appended, and numerous plates illustrate the text. - V. S.

7395. Fleming, J. A. and Scott, W. E. List of Geomagnetic Observatories and Thesaurus of Values, III. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, Md., vol. 48, No. 4, 1943, pp. 237-242.

Table 1, Annual Values of Geomagnetic Elements at Observatories, is continued in this issue (for parts I-II of this table see Geophys. Abstracts 114, No. 7015, and 115, No. 7141). - V. S.

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7396. Healy, J. Boron in Hot Springs at Tokaanu, Lake Taupo. New Zealand Jour. Sci. and Technol., Wellington, vol. 24, No. 1B, 1942 pp. 1-17.

In connection with the field-work described in this article, a magnetic survey of the Tokaanu area was made. A series of 100 observations of vertical intensity was made over a strip extending from a mile northwest to 3 miles southeast of the township using a Schmidt vertical magnetometer of the Askania type. The results indicated that in the vicinity of the thermal activity, there are areas of low magnetic intensity. The article is accompanied by a map showing magnetic anomalies and thermal activity in the vicinity of Takaanu. - Terrestrial Magnetism and Atmospheric Electricity, vol. 48, No. 4, 1943, p. 256.

7397. Herroun, E. F., and Hallimond, A. F. Laboratory Experiments on the Magnetization of Rocks. Proc. Phys. Soc., London, vol. 55, No. 309, 1943, pp. 215-221.

Experiments were carried out on a number of rock-samples to determine the intensity of magnetization induced under a variety of conditions. (1) Some specimens were heated to red heat and allowed to cool in the earth's magnetic field. The organization of the experiments is described. When the specimens had cooled, their magnetization was measured and found greatly increased. Moreover, the specimens retained their magnetic properties and showed no appreciable change after 4 months. (2) Other specimens were kept cold and subjected to the influence of a magnetic field. Weak fields, such as the earth's field, produced no magnetization at all. Higher fields produced rapidly increasing magnetization. Very large fields were needed to induce the same magnetic intensity as induced by cooling; even then it was not permanent but died away slowly. If two successive magnetizations were induced at right angles, the second magnetization reduced the first magnetization. The authors compared these results with rocks magnetized naturally. It was found that certain rocks have a natural magnetization as great as that produced by cooling in the earth's field. The conclusion is advanced that such rocks must have become magnetized during a cooling process, because to produce the same results cold would have required a field between 10 and 30 times as great as the present field of the earth (for previous work by the authors, see Geophys. Abs. 56, No. 1689). - V. S.

7398. Hurwitz, Louis, and Howe, H. H. Magnetic Observatory Results at San Juan, Puerto Rico, for 1926-28. U. S. Coast and Geodetic Survey Washington, D. C., MO-16, 1943, 138 pp.

This publication contains extensive tables of observatory results, reproductions of magnetograms showing the more important magnetic storms, and an explanatory text. The tabulated results include hourly mean values of the magnetic elements D, H, and Z, summaries of their monthly and annual means, collected mean diurnal variations for each month, season, and year, lists of principal magnetic disturbances, amounts of noncyclic

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change, observed and adopted baseline values of the D, H, and Z variometers with their abrupt changes, etc. The text includes a description of instruments, discussions of their coefficients and behavior and of the procedures used, and explanations of the various tables. - Authors' abstract.

7399. Johnston, H. F. American Magnetic Character-Figure, C_A, Three-Hour-Range Indices, K, and Mean K-Indices, K_A, for July to September, 1943. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, vol. 48, No. 4, 1943, pp. 228-231.

Tables are given. - V. S.

7400. Johnston, H. F. Mean K-Indices from Twenty-One Magnetic Observatories and Five Quiet and Five Disturbed Days for 1942. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, Md., vol. 48, No. 4, 1943, pp. 219-227.

Tables are given. - V. S.

7401. Orlov, A. Polo Movement from 1891.5 to 1940.0 Compt. rend. (Doklady) Acad. Sci. l'U.R.S.S., Moscow, new ser., vol. 37, No. 9, 1942, pp. 269-273.

Astronomers have sought to establish a constant, or average, position of the pole for stabilizing latitudes, longitudes and azimuths. The writer defines the "average pole" as the position which the pole would occupy were it not for its periodical movement. The average position of the pole at any moment is determined by average latitudes at this moment for various points of the earth's surface. Coordinates of the pole should be computed upon the basis of the deviation of the instantaneous latitude from the mean latitude. The author has calculated the coordinates of the instantaneous pole for a period of 48.5 years, from 1891.5 to 1940.0, according to stated rules and source material. The computations were made on the assumption that the pole is not subject to secular variations. The results are embodied in a table: "Pole coordinates in relation to the mean pole of the epoch." - V. S.

Peoples, J. W., Wells, F. G., Thayer, T. P., and Howland, A. L. Geologic Principles in the search for Chromite Ore (Abstract). Econ. Geol., Lancaster, Pa., vol. 38, No. 1, 1943, pp. 81-82. (See Geophys. Abstract 7387.)

7402. Terrestrial Magnetism and Atmospheric Electricity. Notes: Magnetic Surveys in South and North America. Baltimore, Md., vol. 48, No. 4, 1943, p. 253.

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The magnetic field-party of the United States Coast and Geodetic Survey that has been operating in South America for nearly a year has returned to the United States. Magnetic observations were made in every republic. The program was primarily one of repeat-observations, but several new stations were established near airports in Brazil. Comparison-observations were made at the Huancayo Magnetic observatory in Peru, the Pilar Magnetic Observatory in Argentina, and the Vassouras Magnetic Observatory in Brazil. An observer of the Instituto Geográfico Militar occupied about 50 declination-stations in Uruguay, and another party established 5 good magnetic stations along the coast of Uruguay, using an Askania magnetometer. At all of the latter stations diurnal-variation observations were made over a 3- or 4-day period. Two field-parties of the Coast and Geodetic Survey that had been making repeat-observations in the eastern half of the United States closed their season's work early in November 1943.

403. Walton, M. S., Jr. Magnetic Exploration of the Bohemia Basin Nickel-Copper Deposits, Southeastern Alaska (Abs.). Econ. Geol., Lancaster, Pa., vol. 39, No. 1, 1944. p. 104.

The Bohemia Basin nickel-copper deposits form a part of a composite stock on Yakobi Island, southeastern Alaska. They are segregations of pentlandite, pyrrhotite and chalcopyrite in a zone near the inward-dipping lower contact of a norite mass. In 1943 eight traverses were made in the covered area with an Askania vertical intensity magnetometer. A deposit was detected beneath six of the traverses. The magnetic profiles are consistent with the hypothesis, proved at two places by outcrops and drill hole, that the deposit dips inward. The inferred quantity of sulfide-bearing material in the deposits in the norite mass was increased as a result of the magnotometer work from 5,000,000 to 8,500,000 tons. The magnetic data will facilitate further development of the deposits and would have been useful in the more effective placing of some of the holes already drilled. - V. S.

404. Wantland, Dart. Magnetic Interpretation. Geophysics, Menasha, Wis., vol. 9, No. 1, 1944, pp. 47-59.

It is common knowledge that magnetic anomalies do not always correspond to structural uplifts. The author discusses this problem under the headings of: (1) examples, (2) the magnetic character of sediments, (3) possibilities of magnetic stratigraphic studies, and (4) the place of magnetic surveying. - Author's abstract. (The paper is accompanied by discussions by D. M. Collingwood and by L. J. Peters).

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3. SEISMIC METHODS

7405. Berson, I. S. Odographs of Repeatedly-Reflected Waves, Refracted-Waves, and Refracted-Reflected Waves (in Russian). Bull. Acad. Sci. U.R.S.S. (Izvestiia), Sér. Géograph. et Géophys., Moscow, No. 6, 1942, pp. 274-289.

Equations for odographs (hodographs) of repeatedly reflected, reflected-refracted, and refracted-reflected longitudinal waves are derived for the case of one separating plane. The question is studied what results may be obtained from the interpretation of odographs of the waves described, refracted or reflected only once. Geometrical criteria are laid down for the recognition of the repeatedly-reflected waves and of other types of waves in some special cases. - Author's abstract.

7406. Gaby, P. P. A New Type of Seismic Cross-Section Wherein Accuracy of Representation is Rendered Insensitive to Velocity Error (A.A.P.G. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, p. 105.

In seismograph computations the reflection arrival-time is converted to depth by using a velocity function. But velocities cannot be assumed constant over large areas. Thus, it is necessary to use interpolation or extrapolation in selecting the velocity function for different localities. Such a procedure is complicated and inaccurate, and it requires much recomputation. The author seeks a method for reducing velocity errors in computations. The use of time-sections and time maps usually involves the assumption that the horizontal offset of the reflecting point is zero; such an assumption may largely invalidate results in areas of deep or sharp folding, or in faulted areas. Most other procedures adopt some velocity function before representation; such a representation is very sensitive to error in the assumed function, so that subsequent recomputation must begin at the point where the velocity function was first used. To meet these criticisms the author proposes a new method. A concept is advanced of a section wherein the horizontal coordinate is the horizontal distance and the vertical coordinate is the vertical travel time. A cross section in such space utilizes a velocity function to determine the horizontal offset of each reflecting point and the computed vertical time from reflecting point to reference plane. The plotting of seismic data in these coordinates is described and discussed. The representation of data in terms of this system is insensitive to errors in the assumed veolcity function. - V. S.

7407. Gebhardt, R. E., and Nelson, J. H. The Seismological Installation at the Sitka Magnetic Observatory. Nat. Research Council, Am. Geophys. Union, Trans. 1943, part I, Washington, D. C., 1943, pp. 91-95.

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Various defense projects at Sitka, Alaska, forced the moving of the local magnetic observatory to the outskirts of the town in the fall of 1940. The seismological installation of the observatory is now located in a reinforced-concrete vault built into the side of a hill. It is equipped with Wenner seismometers and a motor-driven seismograph recorder. The recorder has an electric circuit so arranged that the drum speed is controlled by a short impulse from the observatory clock. The impulse turns on the power for a motor, while a cam on the motor shaft interrupts the circuit after an adjustable time interval. The motor is a small D. C. device used for flasher-mechanisms; it can run about a year on three or four dry cells. The observatory clock has an invar staff and metal bob; it is equipped with contacts that operate once per second and once per minute, respectively, while two separate sets operate once per hour. As a result of those arrangements, the drum speed of the recorder is very uniform. - V. S.

7408. Gillin, J. A., Arnett, R. D., and Alcock, E. D. The Correlation Refraction Method of Seismic Surveying (Am. Assoc. Petrol. Geol. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, pp. 106-109.

The reflection method of seismic prospecting is found to fail in some areas. The causes are surface conditions, discontinuities in the subsurface, lateral changes in velocities, etc. Accordingly, each area must be studied in its own terms to remedy the failure. Still, in some cases no remedy can be found. Such is the case of the Edwards Plateau in West Texas. The cause here seems to be a thick and hard lime on the surface. This conclusion is based upon the observation that in the sections of the plateau where the lime is absent, thin, or overlain, the reflection method does work. A successful solution for the plateau has been the correlation refraction method. It is based upon the interpretation of the recorded arrivals of energy traveling from the shot point to the instruments along refracted paths. The interpretation is not necessarily confined to one horizon. The paper discusses the underlying theory of this method and describes the field technique. - V. S.

7409. Gutenberg, Beno. Variations in Physical Properties Within the Earth's Crustal Layers (Abstract). Nat. Research Council, Am. Geophys. Union, Trans. of 1943, part I, Washington, D. C., 1943, pp. 281-282.

An investigation was made in southern California of the amplitudes of P-waves having epicentral distances from 50 to 570 km.; 300 instances were used. This investigation shows that the velocity of longitudinal waves in a granitic layer at depths of 2 to 18 km. is $V = 5.56 + 0.001\ h$ (in km./sec). Similarly, the investigation of Py-waves gives a velocity of $6.0 + 0.01\ (h-18)$ in km./sec. for the (first) intermediate layer. Inside the granitic layer the amplitudes of Py-waves should about equal those of Pn-waves.

The velocity of Pn below the Mohorovicic discontinuity at a depth of 35 to 40 km. is close to 8.0 km./sec. The velocities of both P and S

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at first increase with depth, but the rate of increase falls off rapidly with increasing depth; as a result, the amplitudes of Pn and Sn rapidly decrease with distance beyond $\Delta \approx 200$ km. Since amplitudes of various P and S waves change with distance in a similar way, the effect of pressure and temperature on the coefficient of rigidity must be relatively the same as on the bulk-modulus.

It may be concluded that at a depth of about 80 km. the melting point of the material is reached. Immediately above that critical depth, the effect of temperature on the bulk-modulus and on the coefficient of rigidity may approach, or even surpass, the effect of pressure. At the critical depth itself, there may be a slight sudden decrease of the wave-velocity. At greater depth, the effect of the temperature on the bulk-modulus and the coefficient of rigidity becomes more and more insignificant. Whereas above the critical depth a certain minumum stress is required to start plastic flow, below this depth no appreciable strength exists, and the plastic flow is controlled only by the viscosity of the material. - V. S.

7410. Hayes, R. C. Earthquakes in New Zealand During the Year 1941. Dominion Observatory, Bull. S.68, Wellington, 1943, pp. 210b-211b.

New Zealand's earthquakes during 1941 are listed with their dates and approximate times. An accompanying map shows the epicenters of the principal earthquakes; shocks with origins deeper than normal are indicated by distinctive signs. Two smaller maps give the approximate isoseismals for the two largest earthquakes during the year. A note is added on the main features of the earthquakes of 1941. - V. S.

7411. Heck, N. H. Advances in Engineering Seismology. Civil Eng., New York, vol. 12, No. 1, 1942, pp. 30-34.

In seismological blasting it is sometimes necessary to determine the possibility of injuries to buildings. This paper outlines the report of N. H. Heck on the strong-motion research of the U. S. Coast and Geodetic Survey, prepared for the Joint Committee on Seismology of the Soil Mechanics and Foundations Division, American Society of Civil Engineers. In its work, the Coast and Geodetic Survey uses three general types of strong-motion instruments: Accelerographs, displacement meters, and Weed instruments. They measure acceleration, velocity, ground displacement (oscillatory), and periods; special research has been conducted to test the accuracy of these determinations. Since the start of the work in 1933, five earthquakes were recorded. The relationship of earthquake destructiveness to the elements of earth motion has not been so far fully established. The most important problems in this relationship are acceleration, resonance, and duration, including accumulative effects of strong aftershocks. These problems are discussed in connection with the instruments and methods of study. - V. S.

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Rey, P., and Oks, M. Cordinación de metodos geofisicos (Coordination of Geophysical Methods). Bol. Inform. Petrol. (YPF), Buenos Aires, vol. 20, No. 230, 1943, pp. 3-15. (See Geophys. Abs. 7388.)

7415. Richter, C. F. Calculation of Small Distances. Bull. Seismol. Soc. America, Berkeley, Calif., vol. 33, No. 4, 1943, pp. 243-350.

Tables are presented which facilitate the calculation of small distances between points on the earth's surface whose latitudes and longitudes are given, for mean latitudes from 30° to 40°. The error does not exceed one-tenth of a kilometer in 500 kilometers, and may be reduced by applying specified corrections. - Author's abstract.

7416. Rosaire, E. E. Reflection Seismograph Performance Along the Gulf Coast. Oil Weekly, Houston, Tex., vol. 113, No. 6, 1944, pp. 16-24.

The reflection seismograph is the main prospecting method at present. It has dominated exploration on the Gulf coast since about 1930. The author studied the performance of this method on the Gulf coast to determine its typical measure of success. A measure of success is defined as the ratio of attainment to effort. This ratio was computed in three different ways for the period 1929-43. The methods of computation, data, resulting ratios, and deduced trends are discussed, and conclusions are drawn. (1) The achievement-ratio, expressed in confirmation per crew-year, was abnormally high in the first 2 discovery years, then dropped abruptly, but since has shown a slow linear increase indicating the technical improvement of the reflection method. (2) The initial-risk ratio, expressed in crew-years per confirmation, has decreased and finally became reduced by 50 percent over a period of about 10 years. (3) The gross-reward ratio, expressed as millions of barrels discovered per crew-year, showed an expotential decrease of 50 percent every 2.5 years. Thus, the exploration technologist is justified in his reliance upon the reflection seismograph, as evidenced by the increasing achievement-ratio. But the executive finds that the initial-risk ratio has halved once and so decreased by 50 percent over the past 10 years, while the gross-reward ratio has halved four times in succession and so has decreased about 93 percent in the same period of time. - V.S.

7417. Science News Letter. Mexican Seismograph. Washington, D. C. vol. 43, No. 14, 1943, p. 212.

Further information is supplied on the installation of a seismograph at Tonantsintla, Mexico (see Geophys. Abs. 115, No. 7167). The instrument is one of the latest models of the vertical-component Benioff. It has a photographic recorder and is capable of magnifying the ground motions by as much as 250,000 times. The Astrophysical Observatory, where it will be placed, is located east of Popocatepetl and Istaccihuatl Volcanoes. Mexico is believed to be a favorable place for a study of the related problems of earthquakes and volcanoes. The relationship between these problems has been recently emphasized by the appearence of a new volcano in a region where earthquakes have occurred for a long time. - V. S.

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7412. Holmes, W. O. Preventing Power-Line Mishaps in Seismograph Shooting. Oil Weekly, Houston, Tex., vol. 113, No. 4, 1944, pp. 26-28.

Seismograph shooting raises some special problems in addition to the usual precautions of blasting. The problem here considered is shooting near power-lines. The copper wires loading from the shooting truck down the hole to the blasting cap are usually blown up into the air by the explosion. If they come in contact with power-lines while connected with the truck, an electric shock may injure the personnel on the truck. This danger has been recently eliminated by substituting a patented detonating fuse for the portion of the wire extending down the hole. The fuse consists of an explosive core of pentaerythritetetranitrate (PETN) contained within a flexible, waterproofed textile covering. The fuse can be initiated by a No. 6 electric blasting cap and will detonate throughout its entire length. It is relatively insensitive to shock, friction, flame, and water. The danger of contact with power-lines in the air is eliminated because detonation completely disintegrates the fuse. Field tests of the fuse, methods of using it, and various precautions are described. - V. S.

7413. Neumann, Frank. United States Earthquakes, 1941. U. S. Coast and Geodetic Survey, Washington, D. C., Serial 655, 1943, 71 pp.; price, 20 cents.

This summary of earthquake activity in the United States and regions under its jurisdiction for the year 1941 covers: (1) Noninstrumental results in the various States and Territories; (2) miscellaneous activities: geodetic operations of seismological interest, and tidal disturbances of seismic origin; (3) seismological observatory results on epicenters; (4) strong motion seismograph results: shocks, records, constants, and stations; and (5) tilt observations. The abridged scale of the "Modified Mercalli Intensity Scale of 1931", adopted since 1931 in place of the Rossi-Forel scale to designate the intensity of earthquake activity, is given in the introduction, together with equivalent intensities according to the Rossi-Forel scale. - V. S.

7414. Ongley, M. Wairarapa Earthquake of 24th June, 1942, Together with Map Showing Surface Traces of Faults Recently Active. New Zealand Jour. Sci. and Technol., B. General Section, Wellington, New Zealand, vol. 25, No. 2, 1943, pp. 67-78.

The distribution of intensest shaking during the Wairarapa earthquake of 24th June 1942, as indicated by structure-damage and ground-disturbance, is described. The surface trace of the fracture on which movement occurred is mapped. Many similar movements have taken place in the past, here and elsewhere in New Zealand. A map showing the known surface traces of recently active faults is appended. - Author's abstract.

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7418. Shugart, T. R. Frequency Discrimination in the Low Velocity Zone. Geophysics, Menasha, Wis., vol. 9, No. 1, 1944, pp. 19-28.

The various factors controlling the "character" of reflection seismograph records are so numerous and so complex that it is very difficult to isolate and investigate each of them experimentally. One of these factors is the frequency discrimination due to multiple reflections in the low velocity zone ("weathered layer"). With a few simplifying assumptions, this problem reduces to one already treated in the classical theory of acoustics. It is shown that for a given weathering thickness the transmission is a periodic function of frequency. The ratio of the maximum to the minimum energy transmission is nearly equal to the square of the ratio of the specific acoustic impedance of the high velocity to that of the low velocity material. The phase lag due to the presence of the weathered layer is shown to be a nonlinear function of the weathering thickness for any given frequency. Graphs of transmission as a function of frequency are shown for various thicknesses of the low-velocity zone. - Author's abstract.

7419. Stulken, E. J. Effect of Ray Curvature Upon Seismic Interpretations (A.A.P.G. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, p. 109.

In seismic interpretations, the effect of ray curvature on velocity is not calculated with sufficient fullness. The present study analyzes the errors in the computation of specific velocity functions. The analysis is based upon assumptions of a straight path. The discrepancies arising from the use of straight-line depth-determinations are discussed. Dip and offset computations are considered for cases of dipping reflectors. The inaccuracies are illustrated graphically as variables dependent on spread and depth. In some cases, errors are introduced into computations of velocity over curved paths by neglecting irregularities in observed data so as to employ a simple velocity equation. An example is given to show that the usual curved-path procedure may be invalidated by the existence of sloping isovelocity surfaces; vertical travel-time approximations may be more accurate, and they are more easily applied. - V. S.

4. ELECTRICAL METHODS

7420. Easton, W. H. Subsurface Structure and Oil Possibilities of Parts of Edwards, Richland, and Wabash Counties, Ill. Illinois State Geol. Survey, Urbana, Press Bull. Ser., Illinois Petroleum, No. 46, 1943, 12 pp.

A structural study was made in the region of the Bonpas, Bonpas West, Parkersburg, and Samsville oil pools in Illinois. The purpose was to recommend areas for oil exploration and to make contour maps of possible producing formations. The study was made by means of sampling

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and electrical logging; the latter registered self-potential and resistivity. The contoured horizons were the top of the Levias member of the Ste. Genevieve formation, the top of the lower limestone of the Golconda formation, and the base of the middle bench of the West Franklin limestone. The most important structural feature of this area is a series of domes and anticlines aligned nearly north-south and constituting a definite structural trend; the other features include four anticlines with trends about east-west, a depression east of the major trend, and a regional dip from east to west. The data are tabulated, contour maps compared, and recommendations made for drilling. Maps and logs illustrate the text. - V. S.

7421. Gardner, A. M. Electrode Design Solves Problem of Electrical Logging in Oil-Base Drilling Fluids. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 9, No. 3, 1943, pp. 24-26.

Since oil is a nonconductor of electricity, currents from the formations would not reach the standard logging electrode through oil. Therefore, electrical logging in oil-base drilling fluids requires a special type of electrode. The Lane-Wells Co. has developed such an electrode. The problems involved were manifold; they are briefly indicated. The original design has remained generally the same. The electrolog assembly is composed of three to six elliptical springs with their ends attached to sliding collars which ride with a short range of movement along sections of the main stem. These elliptical springs have the shape of birdcages. There are stop collars set on the main stem which prevent the "birdcages" from passing beyond their sections. Each section is electrically insulated from the others. The birdcages are equipped with cutters fixed at the high point of each of their elliptical springs. These cutters penetrate the oil-mud film covering the formations. For this purpose they are wedge-shaped, are made of hard material, and protrude about 3/4 inch above the face of the springs. Such a design insures a sufficiently firm and sliding contact with the walls of the hole for the passage of electrical current. The electrolog assembly can be adjusted by changing the spacing to give different types of logs. A drawing illustrates the instrument, and examples of various logs are appended. Admixtures of oil-base fluids are discussed. - V. S.

7422. Hurd, C. O. Topography's Effect in the Equipotential Line Method. Mines Mag., Denver, Colo., vol. 34, No. 1, 1944, pp. 15-18, 39, 41.

The equipotential-line method locates ore bodies through the distortions which they produce in the lines; but topography itself produces distortions, and apparently it is not possible to correct equipotential lines for the topographic effects. Therefore, it is necessary to distinguish between the effects of topography and the effects of ore bodies. The present experiment was made for determining the extent of distortion produced in equipotential lines by hills and depressions. The apparatus and procedure are described. A search electrode was used to trace equipotential lines on four clay topographical models; for each line a bridge with variable resistance-arms was balanced at the start for a null indication

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on the ammeter and was kept at that setting until the entire line was completed. In some cases, models of ore bodies were placed in different positions in the clay patterns. Samples of tracings are presented for level ground, and for hills and depressions of various form; the profiles of voltage for different models are given. It is found that equipotential lines bend outward around hills; and they bend inward toward the center of depressions. Admittedly, ore bodies can be so located with respect to topography that they would not be discoverable. In most cases, however, it should be possible to separate the effects of topography from the effects of ore bodies. - V. S.

7423. Kornfeld, M. M. Subsurface Correlation by Detailed Electrolog Tabulation (A.A.P.G. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, p. 109.

Subsurface correlation can be made by a method of detailed electrolog tabulation as yet undescribed in the literature. The procedure consists of a superimposition of curve for curve for any two electrologs studied; it is made on a light table. Certain directions are prescribed for matching the curves. The data and measurements gathered by the matching are tabulated in six columns: (1) Electrical curves and markers employed; (2)-(3) the correlative depths of any two wells studied; (4)-(5) the differences between correlation points; and (6) the departures from normal (gains and losses) in the differences between correlation points. This method is quantitative and superior to graphic methods. There is no need to alphabetize and color electrolog sections, so that electrolog strips are preserved as factual rather than interpretative material. A graphic analysis can be made further of the quantative electrolog correlations. The light-table should preferably be of the fluorescent type. - V. S.

7424. Tikhonov, A. N. The Effect of Inhomogeneity of the Earth's Crust on the Field of Terrestrial Currents (in Russian). Bull. Acad. Sci. U.R.S.S. (Izvestiia), Sér. Géograph. et Géophys., Moscow, No. 5, 1942, pp. 207-218.

The distortion of the field of terrestrial currents caused by a body possessing the form of an infinite horizontal cylinder embedded in the ground is studied. Curves are given of isopotential lines and of apparent resistances depending on the position of the embedded body and its electric resistance. - W. A.

7425. Wilcox, S. W. Sand and Gravel Prospecting by the Earth Resistivity Method. Geophysics, Menasha, Wis., vol. 9, No. 1, 1944, pp. 36-46.

The four-electrode earth-resistivity method is applied to the search for sand and gravel deposits in the glaciated areas of the United States. This technique differentiates between clays and granular materials enabling the prospector to outline and roughly estimate the quantities of each without test pits or boreholes. Several examples of field surveys are given. - Author's abstract.

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5. RADIOACTIVE METHODS

7426. Barcklow, J. C. Adaptability of Radioactivity Logs to Limestone Zones in Old and New Wells. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 9, No. 2, 1943, pp. 18-21.

The neutron and gamma-ray curves of the Lane-Wells radioactivity log are useful for oil and gas tests in limestone zones. Three examples are described: (1) Gamma-ray and neutron logs for a well in the Cushing-Drumright area, Okla.; (2) an electrical log compared with gamma-ray and neutron logs for adjacent wells in the Beebe area, Pontotoc county, Okla.; and (3) an electrical log compared with gamma-ray and neutron logs for the same well in northwestern Kansas. It is concluded that the gamma-ray curve is useful because it differentiates limestones, sandstones, dolomites and conglomerates from shale bodies. The neutron curve is useful in limestone zones because it gives good indication of strata that contain liquid and are thus necessarily porous; electrical resistivity logs for such zones vary excessively and have little value. The radioactivity logs and the examinations of samples from wells are all that is necessary for tests in areas producing from limestone. - V. S.

7427. Beers, R. F. The Radioactivity and Organic Content of Some Paleozoic Shales (Am. Assoc. Petrol. Geol. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, p. 105.

The important radioactive elements in sedimentary rocks are uranium, thorium, and potassium. The previous studies by Beers and Goodman has shown four principal loci where these elements can be found; the loci are indicated. Now it is discovered that Paleozoic black shales containing up to 16 percent organic matter possess high concentrations of the three radioactive elements; excellent correlations exist between their contents in individual shale formations. On the other hand, pure limestones and pure quartz-sands exhibit practically no measurable radioactivity. These studies have resulted in a new method for the routine determination of uranium, thorium, and potassium. They also throw a new light on the evolution of petroleum source beds and on other problems. - V. S.

7428. Belousov, V. V. Migration of Radioelements and the Development of the Structure of the Earth (in Russian). Bull. Acad. Sci. U.R.S.S. (Izvestiia), Sér. Géograph. et Géophys., Moscow, No. 6, 1942, pp. 298-317.

A new geotectonic hypothesis is briefly described. According to this hypothesis the main energy factor in geotectonogenesis is radioactive disintegration. Based upon the irregular centrifugal migration of radioelements connected with granitic intrusions, the geotectonic processes may be explained by measuring the thermal regime of the earth caused by deep migration of radioelements and by their redistribution within the earth. - Author's abstract, translated by W. A.

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7429. Campbell, J. L. P. Checking Your cement Jobs with Radioactivity Logging. Tomorrow's Tools - Today, Los Angeles, Calif., vol. 10, No. 1, 1944, pp. 24-26.

Radioactivity logging has been recently used to determine the distribution of cement in oil wells. This question may arise in well-completions necessitated by poor cementing or squeeze jobs. The cement must be mixed with carnotite. After such a cement is in place, its displacement and distribution behind the pipes are judged from accentuated anomalies or kicks appearing on the radioactivity log. The logging procedure is described. Before cementing is started in a well, a gamma-ray log is run to provide a reference curve and to define the formations through which the cement is to extend. This curve is more desirable than an electrical log because shales vary in gamma-ray intensities. The carnotite cementing is then carried out; instructions are given for this work. After the cement has hardened, a repeat gamma-ray curve is made. A comparison of the two logs reveals the actual location of the carnotite cement. For an example, the case of a well in which gun perforations were squeeze-cemented is discussed and illustrated by samples of the two logs. Carnotite is hydrous potassium uranyl vanadate ($K_2O.2U_2O_3.V_2O_5.3H_2O$), a radioactive material used for the production of vanadium, uranium and radium salts. It is found in western Colorado and eastern Utah, mined as an ore, and ground to powder; the cost of this mineral is fairly low. - V. S.

7430. Conklin, G. M. Gamma-Ray Well Logging in Trinidad. Petrol. Interamer., Printed in Spanish and English, Tulsa, Okla., vol. 1, No. 2, 1943, pp. 42-48.

The Trinidad Leaseholds, Ltd., imported recently a radioactive well-logging unit of the Seismograph Service Corporation of Tulsa to Trinidad. The purpose was to locate cased-off sands, possibly containing oil. The present paper is concerned with the work in the southern geological province of Trinidad; this province comprises the Southern Range, the core of which is covered largely by Miocene deposits. The local geology is described; it has certain unusual features. Schlumberger electrical logging and core-sampling had been used in this region. The Seismograph Service Corporation equipment was put to work under favorable conditions; essentially the same technique and logging speeds were used as in the United States. Unexpectedly, it was discovered that the oil sands in Trinidad are more radioactive than the water sands (usually oil and water sands are not differentiated because both are insufficiently radioactive). The reason may be a lower porosity or a clay contamination of the oil sand, or else the oil may be slightly radioactive. If the latter were true, gamma-ray surveys would be very effective in Trinidad. The equipment, local field conditions, logging operations, and results of the survey are described. - V. S.

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7431. Evans, R. D., and Goodman, Clark. Alpha-Helium Method for Determining Geological Ages. Phys. Rev., Lancaster, Pa., vol. 65, Nos. 7-8, 1944, pp. 216-227.

New techniques for determining the rate of helium production in igneous rocks by direct counting of the alpha-rays, combined with the removal and measurement of the helium accumulated in a rock specimen during geologic time, provide a direct physical method of helium age analysis which is free from complicated chemical manipulation, makes possible more rapid measurement of the helium and radioactivity of terrestrial materials, and has only a second-order dependence upon radioactive standards. Equations are derived which relate the true rate of production of helium to the observed rate of alpha-particle emission from a thin source. Age relationships are derived which allow a simple, but accurate, correction to be applied to the approximate age in obtaining the true age of geologically old materials, in which the decay of the parent radioactive elements has been appreciable. Intercheck radioactivity measurements have established the mutual reliability of the alpha-count method and the radon-thoron method of determining the total radioactive content of rocks and ores and have shown that there are no unknown, strong, alpha-emitting, radioactive elements in ordinary terrestrial materials. The agreement between the "alpha-helium" and "radon-thoron-helium" ages on the same samples indicates that the accepted decay constants of the parent elements, thorium and uranium, are correct to within the experimental uncertainty of the measurements (±5 to 10 percent). The application of the alpha-helium method to igneous rocks has revealed that certain mineral constituents allow a significant amount of their radiogenic helium to escape during geologic time. For this reason the revised helium time scale is based on measurements of selected retentive minerals, magnetite being one of the most promising. As a byproduct of these researches, the alpha-activity of 81 rock specimens has been found to range from 0.0 to 5.8 with an average of 1.23 alpha-rays per hour per milligram. - Author's abstract.

7432. Fritsch, V., and Forejt, H. (Exploration of Steeply Inclined Surfaces of Electrical Discontinuity Underground by Radio Prospecting.) Hochfrequenztechn. u. Elektroakust., Berlin, vol. 59, February 1942, pp. 41-45.

The principle of radio prospecting is described. Underground discontinuities are explored by measuring the changes in capacitance substituted in an oscillating circuit formed by an aerial, impedances, and discontinuous underground layer. A special bridge was developed for the purpose. The contact surface between permic and carbonic sandstone was determined by this method. - R.N., Sci. Abs., Sect. B, vol. 46, No. 551, 1943.

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7433. Gerling, E. C. Age Determination of Rocks and Minerals by the Helium Method (Abs.). Internat. Geol. Cong., 17th Sess., U.S.S.R., 1937; Abs. of Papers, Moscow, 1937, p. 194.

The helium method leads to an underestimation of the geological age of rocks and minerals, due to helium escape. The precision of this method can be gauged by means of helium diffusion or heat diffusion in a solid body. In such diffusions, the transference of helium atoms occurs through the mediation of the atoms of the solid body. Observations showed for uranium a diffusion of the part of helium given off by the solid body. Disturbances in the body, such as occur particularly in highly radioactive minerals, increase diffusion. The underestimation of age by the helium method has been demonstrated in the case of the ancient minerals and rocks of North Karelia. Helium escape from various minerals into vacuum at different temperatures should be made the subject of study because it tests the fitness of the minerals for age determination. - V. S.

7434. Khlopin, V. G. Oxygen Method for Geological Age Determination by Professor Lane (Abs.). Internat. Geol. Cong., 17th Sess., U.S.S.R., 1937; Abs. of Papers, Moscow, 1937, p. 193.

The limitations and advantages of the oxygen method for determining geological age are listed: (1) The method can be applied only to uranium minerals with a uranium content UO_2 at the moment of formation; (2) it is necessary merely to measure the quantities of UO_3 and UO_2 in the mineral at the moment of analysis; (3) the method cannot be applied to secondarily changed minerals and minerals containing water; and (4) the method may be used in conjunction with the lead method for several purposes which are indicated. - V. S.

7435. Marble, J. P. Allanite (Orthite) as an Index of Geological Age (Abs.). Internat. Geol. Cong., 17th Sess., U.S.S.R., 1937; Abs. of Papers, Moscow, 1937, pp. 193-194.

The studies of Wells, Lokke, and the writer have shown that unmodified allanite (orthite) can serve as an index of geological age. For this determination the lead method must be employed, as is done with other uranium and thorium minerals. The age measurement consists of analyses for lead, uranium, and thorium, and of radiographs for testing contamination by other minerals. The use of allanite much broadens the applicability of the lead method to problems of geological age. - V. S.

7436. Permiakov, V. M. The Determination of Geological Age of Minerals and Rocks by the Lead Method (Abstract). Internat. Geol. Cong., 17th Sess., U.S.S.R., 1937; Abs. of Papers, Moscow, 1937, p. 194.

The determination of geological age by the lead method requires a measurement of very small amounts of lead. Fortunately, radioactivity

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indicators provide an accurate means of measuring lead emanation from minerals and rocks. The use of these indicators makes it possible, moreover, to discover the most important sources of error. Therefore, measurments of lead emanation furnish the best method for detecting small quantities of lead. In the present investigation such determinations were made calorimetrically, and on the polarograph. The Khibine massif and the North Karelian formations were used for the determination of geological age. The probable age of Khibine lovchorites was found to be $(360 \pm 40) \times 10^6$ years; that of Karelian monazites, about (1,750 to 1,800) $\times 10^6$ years. - V. S.

7437. Short, E. H., Jr. Use of Gamma-Ray Curves Increases Possibilities of Successful Work-Over. Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 45, 1944, pp. 85-87.

Gamma-ray logging is useful in working over completed wells. It serves to detect possible pay-horizons cased off during the original drilling. Such application has been made particularly on the Texas Gulf coast. Here the old fields - Barbers Hill, Thompson, and Conroe - were drilled before the introduction of electrical surveying. Thus, gamma-ray logging can furnish entirely new information. The typical recompletion technique used at the Conroe field is described. This well had been abandoned in 1932 and went dead in 1942. The only available record had been the driller's log. Before a gamma-ray survey was made, the well was mudded and tubing pulled. The log was run from 3,500 feet to total depth. A comparison between the driller's log and the gamma-ray log showed a vast difference in sand distribution; a thick shale break was discovered above 5,100 feet. As a result, the liner was gun-perforated, cement squeezed, plug drilled, etc. Immediately after this work, 167 barrels of oil were obtained daily. - V. S.

7438. Spatz, W. D. B. The Factors Influencing the Plateau Characteristics of Self-Quenching Geiger-Müller Counters. Phys. Rev., Lancaster, Pa., vol. 64, Nos. 7/8, 1943, pp. 236-240.

Investigations of factors influencing the starting potential and plateau slope of self-quenching G-M counters show: I. Impurities such as air or oxygen increase the plateau slope and starting potential of argon-alcohol counters. II. Operation of the counter causes changes in plateau characteristics as follows: (a) Immediately after use, the plateau slope increases slightly. (b) With continued use the plateau slope becomes steeper. (c) For moderate use the counter recovers when inactive, but never to the original characteristics. (d) With further use the counter loses its plateau and does not recover. (e) The pressure in an argon-alcohol counter was observed to increase as a function of the total number of counts recorded. III. For argon-alcohol counters the useful life in these experiments was found to be about 10^9 - 10^{10} counts; for argon-methane, 10^7 - 10^8 counts. The observed changes of characteristics are presumably due to the decomposition of the organic vapor by the discharge. - Author's abstract.

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7439. Starik, I. E. Critical Survey of Radioactive Methods for the Determination of Geological Age (Abs.). Internat. Geol. Cong., 17th Sess., U.S.S.R., 1937; Abs. of Papers, Moscow, 1937, pp. 192-193.

Radium is so durable that it can be used for determining long and short periods of geological time. Two groups of radioactive methods should be distinguished: (1) Lead and helium - primary methods based upon the calculation of the time of radioactive decomposition itself; and (2) aureole and oxygen - secondary methods based upon the effects produced by radioactive rays; here time is calculated from the intensity of the rays' action. The necessary conditions and sources of errors in the more precise primary methods are discussed and classified. - V. S.

6. GEOTHERMAL METHODS

7440. Flugge-DeSmidt. Mining Ventilation. South African Min. and Eng. Jour., Johannesburg, vol 53, May 16, 1942, pp. 283-287.

Reporting a geothermal gradient of 4°.62 F. per 1,000 feet and an observed temperature of 100°.6 F. at 7,700 feet depth in virgin rock in the central rand which is close to values accepted for upper mine workings. A discussion of numerous factors in mine ventilation and temperatures on wet and dry bulb thermometers for the limit of human comfort. Depths to which mining can be carried are dependent on the above factors. - D. W., Mines Mag., vol. 33, No. 2, 1943.

7. GEOCHEMICAL METHODS

7441. Berger, W. R. Geologic Significance of Oilfield Waters and Their Relationship to Structure and Production (Abstract). World Petrol., New York, vol. 15, No. 1, 1944, p. 58.

It is reported that a study of the chemical analysis of oil field waters has shown that in some geologic basins there is apparently a relation between the salt concentration of the water and the configuration of the basin. The total solids increase basinward and their amount is less on structural highs than in adjacent synclines. The constituents vary sufficiently to allow inferences regarding structural areas and possibly production of oil. Additional study might prove the relations that are to be anticipated in many basins, thereby giving the oil industry a new tool in oil exploration.

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7442. Petraschek, W. Geochemische Bodenuntersuchungen, ihre Eignung für Kohle (Geochemical Depth Surveying; Its Applicability to Coal). Berg- und Hüttenm. Monatschr., Loeben, vol. 89, No. 1, 1941, pp. 3-4

Discusses the question of the possibility that soil analysis might be used to trace the presence of coal as well as oil. - G.H.C., Annotated Bibliography of Economic Geology, vol. 14, No. 1, 1942, p. 134.

7443. Theodorovich, G.I. Oil Reservoirs of the Ishimbaevo-Sterlitamak Region. Compt. Rend. (Doklady) Acad. Sci. l'U.R.S.S., Moscow, vol. 34 Nos. 4-5, 1942, pp. 126-129.

The oil reservoirs of the Ishimbaevo-Sterlitamak region are made of carbonaceous rocks varying in their composition, porosity and other features; they were shown by the author to be associated with sulfur depositions in the overlaying strata (see Geophys. Abs. 7444.) The author now discusses these reservoirs with regard to their classification. He considers that from the point of view of oil recovery the basis of classification should be the oil-permeability of the reservoirs. Accordingly, the following classification is offered for this region: (1) reservoirs more or less uniformly permeable - porous and cavernous limestones and dolomites, 4 classes; (2) reservoirs of irregular and local permeability - porous and cavernous limestones and dolomites, 4 classes; and (3) fissured reservoirs permeable only along fissures - fissured dolomites and fissured limestones with caverns, 2 classes. - V.S.

7444. Theodorovich, G. I. Sulfur as a Guide in Prospecting for Oil (According to Evidence Obtained in the Region of Sterlitamak-Ishimbaevo). Compt. Rend. (Doklady) Acad. Sci. l'U.R.S.S., Moscow, vol. 34, Nos. 4-5, 1942, pp. 121-125.

The author seeks to settle the question as to how far the presence of sulfur may be considered an index to the occurrence of oil. From the data gathered in the region of Sterlitamak-Ishimbaevo it appears that the formation of sulfur in the strata overlaying certain oil deposits was caused at least partly by an upward migration of the gaseous components of the oil. Subsequently there occurred an oxidation of the oil gases, mainly of hydrogen sulfide, at the boundary between the upper (reduction) and the lower (oxidation) zone, whereby sulfur was formed. The presence of sulfur in association with bitumen is an even more reliable indication of commercial oil than of bitumen alone, for it shows that the original, deep-lying oil deposit is neither drained nor oxidized. If the rocks in the roof of an oil deposit and its gas cap are not disturbed, neither sulfur nor bitumens are found over the deposit. The observations on the occurrence of sulfur are described in some detail. They point to a number of concrete problems of oil exploration in the Sterlitamak-Ishimbaevo region. - V. S.

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8. UNCLASSIFIED METHODS AND TOPICS RELATED TO GEOPHYSICS

445. Adler, J. L. Geophysical Exploration for Stratigraphic Oil Traps. Geophysics, Menasha, Wis., vol. 8, No. 4, 1943, pp. 337-347.

Stratigraphic traps are defined and classified, and the applicability f various geophysical methods for the discovery of each of the different ypes of stratigraphic traps is discussed. Some undeveloped techniques re suggested in this connection as subjects for research. - Author's bstract.

446. Biccard Jeppe, C. W. Rock-Pressure Problem. South African Min. and Eng. Jour., Johannesburg, vol. 54, part 2, No. 2640, 1943, pp. 15-19.

New information has been recently gained on rock pressure. Rocks ompress under pressure; confined rocks withstand higher pressure than nconfined; an excavation apparently produces a ring of pressures higher han existed heretofore; stresses in rock are unevenly distrubuted, nlike hydrostatic stresses; shearing is probably due to differential tresses; many physical properties of rocks, such as elasticity, change ith increasing stresses and affect the rate of propagation of seismic nd some electrical waves, as well as rock temperature, etc. Upon the asis of this information a new classification of bursts is offered and he theories of pressure-bursts are reviewed and evaluated. The pre- ention and prediction of pressure-bursts are discussed. Among the arious means of prediction are listed geophysical methods: (1) Measure- nts of changes of the velocity of seismic and electrical waves; and 2) measurements of changes of temperatures in boreholes drilled into ock masses. - V. S.

447. Boots, P. H. A geophysical Survey of Kuwait, Persian Gulf (Am. Assoc. Petrol. Geol. Digest). Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, pp. 105-106.

In 1936-37 a geophysical survey was made in Kuwait, between Iraq d Saudi Arabia at the head of the Persian Gulf. Before this survey ry scant geological information had been available. The survey used ravimeter and magnetometer for reconnaissance, and seismometer for fuller ploration; eventually the entire country was covered by a gravity survey. is combined work has led to the discovery of an oil-bearing structure ich was drilled and proved to be a large oil field. The organization the survey, the various local problems, and the unified coordination methods are discussed in some details. - V. S.

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7448. Brant, A. Geophysical Methods Have Role in Prospecting. Northern Miner, Toronto,Canada, Ann. No., 1943, sec. 4, pp. 52-53.

Geophysical methods are listed and their limitations are discussed. In the Canadian Precambrian the magnetic, self-potential, and resistivity methods are more generally practicable. Of these only the magnetic method is broadly useful. These applications should be widened. The author offers a program for a greater use of geophysics: (1) Regional geologic mapping should be made by central government and provincial bureaus; (2) prospecting parties should be provided with simple geophysical equipment and training; (3) research in geophysics and other phases of exploration should be organized in a central institute, in part supported by mining companies; and (4) all exploration results should be filed with the Mines Department for reference. Such a program must be accompanied by a simplification of geophysical methods and instruments, reduction of the cost and obtaining of results easily plotted. A portable, lightweight drill is particularly emphasized as a dependable and immediate test of field observations. The wide application of geophysics in standardized and accessible form can alone improve exploration. - V. S.

7449. Chiriboga G., Alfonso. Extensive Exploration Under Way in Ecuador. Petrol. Interamer., Printed in Spanish and English, Tulsa, Okla., vol. 1, No. 4, 1944, pp. 92-99.

Oil is found in Equador, mostly on the coast to the west of Los Andes. The producing oil pools are described with respect to geology, tectonics, and stratigraphic succession; at present the peninsula of Santa Elena is the only important producing region. The large potential oil deposits lay along the coastal belt and in the oriental region. (1) The coastal belt has numerous oil concessions. The most important are the concessions of the International Petroleum Co. north of the Santa Elena peninsula; they are being explored by geological and geophysical methods, as well as by aerial reconnaissance. (2) The region east of the Andes has the large oil concession of the Shell Oil Co. of Ecuador bordering Columbia. This company is doing aerial surveying, geological and geophysical exploration, and paleontological studies. The geology of this region is described. - V. S.

7450. Eckhardt, E. A. Average Number of Geophysical Parties Shows Increase Despite Draft. Oil Weekly, Houston, Tex., vol. 113, No. 4, 1944, pp. 17-18.

During 1943 geophysical exploration in the United States has increased 55 percent over the previous year, in spite of war drain on manpower (for exploration statistics of 1942 see Geophys. Abs. 113, No. 6942). A chart presents the progress of seismic and gravimetric prospecting month by month during 1937-43. It shows that the number of parties for both methods was in 1943 at the highest level ever achieved. Seismic work has mounted from an average of 226 parties in 1942 to an average

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of 255 in 1943; in the first half of the year there was an average of 248 parties, and in August a peak of 270 parties was reached. The performance of parties was below par owing to difficulties in finding experienced men and giving them satisfactory transportation, housing, etc.; an appreciable number of the new men is of the predraft age. Another chart shows the distribution of geophysical exploration by states and the relative frequency of different methods in the U.S.A. Seismic work composed 76 percent of total exploration; gravimetric work, 21 percent; magnetic work, 2 1/2 percent; and other methods, 1/2 percent. The chart is accompanied by a discussion of trends. The discovery rate has not kept in step with the increase in exploration. The remedy would seem to consist in a better integration of the components of present exploration, for no new methods are in sight. - V. S.

7451. Fleming, J. A. Summary of the Year's Work, to June 30, 1943, Dept. Terrestrial Magnestism, Carnegie Inst. Washington. Terrestrial Magnetism and Atmospheric Electricity, Baltimore, Md., vol. 48, No. 4, 1943. pp. 207-213.

Geophysical research from July 1, 1942 to June 30, 1943, was curtailed by the war. At least 95 percent of the services of personnel and all of the laboratory, shop, observatory, and building facilities of the Department were devoted to investigations of war problems. Many organizations and observatories, however, have maintained at least part of their programs, so that the loss of continuity in data is not serious. The reported activities are classed under the following headings: (1) Geomagnetic investigations; (2) terrestrial electricity; (3) ionosphere; (4) nuclear physics; (5) observatory and field work; and (6) special publications. These activities were mostly outlined in a previous report for the year April 1942 to March 1943 (see Geophys. Abst. 116, No. 7268); they have been generally continued. The present summary is more comprehensive than the preceeding one. - V. S.

7452. Gardner, D. H. Geophysics - Scientific Exploration for Oil. Electronics, Albany, N. Y., vol. 16, No. 3, 1943, pp. 136-137, 226-232.

The author discusses the part of electronics in geophysical exploration, as well as in production. Electronics is now applied to instruments used in most geophysical methods, such as gravitational, magnetic, seismic, electrical, and thermal. (1) Gravity meters employ electronic equipment in both the temperature-control apparatus and the gravity-sensitive and recording instruments. (2) Magnetometers of the inductor type can be operated both on land and under water, making surveys of varying terrain possible. (3) Seismic reflection methods are based upon a conversion of acoustic energy into electric energy, which is then passed to high-gain amplifiers and recording galvanometers. Particularly important in this equipment is the use of tubes and radio communications. The principles of reflection surveying are described in some detail. (4) Relection seismograph amplifiers, the radio equipment for transmitting

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and recording, and other instruments make use of the vacuum tube. (5) Electrical methods measure the earth's natural potential, polarization effects, radio-field strength, etc. by means of apparatus made highly sensitive by electronic devices. (6) The gamma-ray logs, acoustic logs, mud-logs, etc., use the vacuum tube and the electronic-circuit technique. Remote control is employed in several geophysical methods. - V. S.

7453. Heiland, C. A. Geophysical Activities and Developments in Wartime. Petroleum, London, vol. 7, No. 3, 1944, p. 48.

An extract from Publication 103, Dept. of Geophysics, Colorado School of Mines. This publication is a reprint from Mining and Metallurgy, New York, 1943 (see Geophys. Abs. 112, No. 6822).

7454. Heroy, W. B. All Methods of Discovery Are Needed to Reverse Trend of Petroleum Reserves. Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 12, 1943, pp. 105-106.

From 1900 to 1925 the volume of proved reserves was generally near the current annual production, but for the period 1925-31 the volume of new reserves discovered substantially exceeded production. In 1930 East Texas was discovered, and for several years it overshadowed all other development. In 1932 and 1933 less oil was discovered than was produced. The advent of proration had a stabilizing action, and in the 1934-38 period 9,600,000,000 bbl. of oil was discovered and 5,800,000,000 bbl. produced. At the end of 1938 the total reserves were 17,400,000,000 bbl., or more than 14 times the 1938 production. Much of the rapid building-up of reserves was due to the application of geophysics, and in the latter part of the 1934-38 period an average of 250 geophysical crews were constantly at work. The reserves found in 1930 were about a third of those found in 1938. In 1940 nearly as much oil was found as was produced, but 1941 fell back to the 1939 level. It seems likely that the 1942 discoveries will provide reserves equal to about a half of that year's production. In this past period production was about 5,400,000,000 bbl.; and discoveries may not have exceeded 3,900,000,000 bbl., although at its end about 330 geophysical crews were in the field. 44 percent more wildcats were completed in 1941 than in 1937, and there was a corresponding increase in the number of successful wells and fields found. However, the size of the new fields fell from an average of 11,000,000 bbl. in 1938 to 2,000,000 bbl. in 1942. It seems probable that most of the structural traps containing important oil fields have been located, due to the efficiency of geophysics. At the present rate of wildcatting it seems that about 3,350 wildcats will be drilled in 1943, but with the existing volume of reserve added per wildcat, the discovery of a volume of oil equal to the current production would require 5,600 wildcats in 1943. P.A.W. has urged the drilling of 4,500 wildcats this year, hoping thereby to increase the number of random wildcats and to encourage the testing of the best available prospects. - G.D.H., Jour. Inst. Petrol., vol. 29, No. 240, 1943; Abstracts, pp. 425A-426A.

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7455. Howard, W. V. Outline of Oil Possibilities of Shield Area of South America. Petrol. Interamer., Printed in Spanish and English, Tulsa, Okla., vol. 1, No. 4, 1944, pp. 78-84.

The shield-area of the eastern half of South America is usually supposed to have poorer oil possibilities than the cordilleran and sub-Andean areas. The author reviews the geological theories of the origin of the Brazilian shield. He points out that the revival of the Gondwana-land theory in modified form improves the chances for oil in eastern South America; the geological considerations favoring this view are discussed. The main promise lies in the marine intercalated beds, as exemplified at Comodoro Rivadavia. Therefore, exploration for oil will probably begin with stratigraphic tests. Further work will depend on local geology. (1) Where the lower Devonian and Pennsylvanian rocks are exposed, the search may be made by geological or geophysical prospecting for structure. (2) Where these rocks are overlain by later deposits, seismic surveying may locate bodies of these older beds by taking into account the interval between the glacial deposits and the basement rocks. (3) Where oil deposits are located in Tertiary beds, mostly covered by a blanket of continental deposits, a correlation of results obtained by stratigraphic tests may prove successful. - V. S.

7456. Kelly, S. F. Geophysicists, as Usual, Find Material for Discussion. Min. and Met., New York, vol. 25, No. 448, 1944, pp. 219-220.

The annual meeting of the American Institute of Mining and Metallurgical Engineers was held in New York City on February 21-23, 1944. The Geophysics Committee held two sessions. Hans Lundberg commented on last year's report by the Geophysics Education Committee and appealed for more training in field techniques. Carl Heiland pointed out the necessity of making courses in geophysics and geology more attractive to students; on the other hand, J. B. Macelwane and S. F. Kelly emphasized sound basic training. S. F. Kelly presented the paper by H. J. R. Way on resistivity prospecting for quartz veins in Uganda and the paper by J. G. Sineriz on exploring for water by electrical and seismic methods. L. W. Blau presented four papers by D. C. Barton in abstract. E. E. Rosaire discussed the future of oil prospecting; in this connection, Frank Rieber commented on the merits of the reflection seismograph. Finally, R. W. Moore set forth a new empirical method of interpreting earth resistivity measurements. - V. S.

7457. Krynine, P. D. Sediments and the Search for Oil. Min. Ind., State College, Pa., vol. 13, No. 3, 1943, pp. 1, 3-4.

Progress in any industry depends on the fruitfulness of its underlying principles. When these principles have outlived their usefulness, no amount of technological ingenuity will bring advances, and new basic principles must be discovered. Until lately the anticlinal theory was the basic principle in geophysical exploration for oil. It now becomes

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apparent that this theory has largely served its purpose. The new principle must be sought in the petrology of sediments. The author has made a comparative study of oil fields in their relation to three classes of sediments - quartzites, graywackes, and arkoses. He concludes that each preferred type of mineral composition must be directly related to a certain preferred texture and structure; further, to a certain preferred type and size of sedimentary body; and, finally, to a certain definite type of oil fields. His aim is to construct correlation tables showing the relation of all forms of sedimentary activity to oil formation and accumulation under the different stages of sedimentary evolution. Valid criteria should be thus found to serve as tools in oil finding. As a byproduct, this study is yielding considerable information on the petrography of oil reservoirs. - V. S.

7458. Oil News. Survey Parties Reported Thick in New Mexico. Albuquerque N. M., vol. 19, No. 23, 1944, p. 1.

Seismograph, magnetometer, and gravimeter work in the Permian Basin is at the highest level in history. There are approximately 55 shooting crews in New Mexico and West Texas compared with a normal number of 20. Of these 55 crews, 35 are working the area with seismograph, the remaining 20 using magnetometer and gravimeter. It is reported that companies contemplate sending 40 crews to Wyoming around April 1, with some of these expected to be drawn from the Permian Basin.

7459. Selsky, V. A. The Structure of the Earth's Crust according to the Data of Applied Geophysics (in Russian). Internat. Geol. Cong., Rept. of 17th. Sess., Moscow-Leningrad, 1937, vol. 4, Moscow, 1940, pp. 457-461.

A study of the earth's crust requires various geophysical data covering both the crust at great depth and the surface tectonics within a depth to 10 km. (1) Gravity data indicate conditions at great depth. They must correlate with surface tectonics to have a bearing on the upper crust. Such is the case of Meinesz' studies of negative anomalies in the Indian Ocean, the Malay Archipelago, etc. As regards positive anomalies, seismic phenomena indicate that in the deep water basins of the Gulf of Mexico, Caribbean Sea, etc. these anomalies would be connected with convectional currents in the substratum. (2) Magnetic disturbing bodies are affected by the general magnetic field of the earth. Since they exert influences on tectonics, they should likewise be considered. Such are the pre-Cambrian strata containing magnetic minerals. (3) Contemporary tectonic movements are to be studied through the distribution of epicenters of earthquakes, of isogons and isopors, and of gravity anomalies. These movements, as well as subcrustal movements, have directions. The existence of direction is indicated by the aggregation of geophysical anomalies along meridional and longitudinal lines. - V. S.

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7460. Turechek, G. F. Determination of Bullet Velocity in Gun Perforators. Tommorrow's Tools - Today, Los Angeles, Calif., vol. 9, No. 2, 1943, pp. 12-13.

The velocity of a bullet is a factor closely related to the stability, penetration, and effectiveness which may be expected in the gun perforation of casing. The equipment used by Lane-Wells Co. for measuring this velocity is here described and illustrated. - Author's abstract.

7461. Wykoff, R. D. Geophysics Looks Forward. Oil and Gas Jour., Tulsa, Okla., vol. 42, No. 46, 1944, pp. 85-90.

This presidential address at the annual meeting of the Society of Exploration Geophysicists has cautioned against underestimating existing methods and placing exaggerated trust in discoveries produced by the war. The present methods give diminishing returns because they seek structures associated with oil, not oil itself, and because they are used for reworking areas already explored in the past. These limitations render existing methods admittedly inadequate for meeting the growing demand. But a review of the basic scientific principles applied in geophysical exploration shows that no revolutionary improvements can be expected from them. At this same time, no new basic principles are likely to come out of the war. The recent advances in geophysical exploration were due to perfected instruments and to competent and resourceful personnel. These factors will remain the chief promise of geophysical progress. - V.S.

9. NEW PUBLICATIONS

7462. Archibald, R. A. (Editor). Mathematical Tables and Aids to Computation, a Quarterly Journal. Washington, D. C., Nat. Research Council of the U. S. A., 1943 -.

The Committee on Mathematical Tables, National Research Council, has started the publication of a new quarterly journal, Mathematical Tables and Aids to Computation (MTAC). R. A. Archibald, chairman of the committee, is the editor. This journal meets an urgent need, because some tables do not merely facilitate work but are indispensable for it; such are tables of the gamma function, of the probability integral, etc. The nature of the journal can be surmised from the first two issues published. The first issue contains notices of 88 tables printed during the last 10 years, detailed reviews of some of them, notices of errors found in the published tables, notices of manuscripts of unpublished tables, and a section of queries and replies. The second issue gives, moreover, an essay on trigonometrical tables in nonsexagesimal arguments, including time. The journal will deal likewise with mechanical aids to computation. - J.H.A., London, Edinburgh and Dublin Philos. Mag. and Jour. Science, vol. 34, No. 238, 1943, p. 794; condensed by V. S.

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7463. Boletin de Informaciones Petroleras (YPF). El Mapa geológico del País (The Geological Map of Argentina). Buenos Aires, vol. 20, No. 2 1943, p. 17

The Administration of Government Oil Fields (YPF) is publishing a geological map of Argentina, scale 1 : 2,000,000. The second section has been printed. It covers the area west of the 62th meridian, between the 32th and 42th parallels; namely, San Luis, Mendoza, Pampa, Neuquen, Rio Negro, and part of Buenos Aires. The data are provided jointly by the YPF and the Administration of Mines and Geology. - V. S.

7464. Bruhns, K. C., Ed. A New Manual of Logarithms to Seven Places of Decimals. Chicago, Ill., C. T. Powner Co., P. O. Box 796, 1944, Revised ed., 610 pp. Price $2.49.

This new manual of logarithms differs from Köhler's Handbook by certa abridgements and expansions. It comprises, namely: (1) Briggs' or commor logarithms of the natural numbers from 1 to 100,000 and the auxiliary trigonometrical functions S and T for the calculation of the logarithms of sines, tangents, and cotangents of the angles from 0 to 10,000 seconds, etc.; (2) logarithms of the trigonometrical functions from 0° to 6° and 84° to 90° for every second; and (3) logarithms of the trigonometrical functions from 6° to 84° for every 10 seconds. - V. S.

7465. Carnegie Institution of Washington. Yearbook 41, July 1, 1941 - June 30, 1942. Washington, D. C., 1942, 309 pp.

In Yearbook 41 of the Carnegie Institution two sections are devoted specifically to geophysical work. (1) Geophysical Laboratory, report by L. H. Adams: The laboratory has undertaken defense research. Most of this work is organized into a single unified program; the remainder is made under special contracts. Some peacetime investigations were completed and prepared for publication; a review of them is appended. (2) Department of Terrestrial Magnetism, report by J. A. Fleming: The Department has continued work on measures of geomagnetic activity, terrestrial electricity, ionosphere, nuclear physics, geomagnetism, observatory- and field-observations, and miscellaneous activities. The publication of "Carnegie" data is announced. A bibliography is appended. - V.

7466. Comrie, L. J., Editor. Barlow's Tables. New York, Dover Publications, 1941, Price $2.49.

The latest edition of Barlow's tables contains square, cube, square root of 10 n, cube root and reciprocal, for every interger from 1 to 12,5 Constants are given to 15 places. - V. S.

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7467. Congrès Mondial due Petrole, 2-ème, Paris, 14-19 Juin 1937, Section Economique, Comité de la Nomenclature. Nomenclature des Termes Techniques de l'Industrie du Petrole (Allemand - Anglais - Français). Mimeographed edition.

The second World Petroleum Congress, Paris, 1937, has published, under the direction of Pierre Minard, a nomenclature of technical petroleum terms, German-English-French. The nomenclature covers various phases of the petroleum industry, such as units of measurement, geology, prospecting, and drilling. English serves as the basis of the alphabetical arrangement. - V. S.

7468. Jahnke, E., and Emde, F. Tables of Functions with Formulae and Curves. New York, Dover Publications, reproducing Teubner's 1938 ed. (Funktionentafeln), 400 pp., 200 ills. Price $3.50.

This handbook contains tables, formulas, and curves of the elementary and advanced mathematical functions. It is prepared for the use of mathematicians, physicists, engineers, etc. The present enlarged and revised English text covers sine, cosine, and log integral; factorial function; error integral and related functions; theta functions; elliptic integrals; elliptic functions; elementary transcendental equations; Planck's radiation function; Legendre functions; Bessel functions; the Rieman-Zeta function; confluent hypergeometric functions; Mathieu functions; cubic equations; exponential function; source functions of heat conduction; and circular and hyperbolic functions of a real and complex variable. Graphical representations of the functions is added to this edition. - V. S.

7469. Jenkins, O. P., and others. Geologic Formations and Economic Development of the Oil and Gas Fields of California. California Dept. Nat. Res., Div. Mines, Geologic Branch, San Francisco, Bull. 118, 1940-43, 773 pp. Price, $4.00.

A compendium on the oil and gas fields of California has been prepared by 126 leading authorities of the subject. It constitutes one of the most important reference works on geology that has appeared in recent years. The present preliminary edition is published in four parts: Part 1, Development of the industry (including exploration), 1940; Part 2, Geology of California and the occurrence of oil and gas, 1941; and Parts 3-4, Description of individual oil and gas fields, Glossaries, Bibliography, and Index, 1943. - Van Tuyl, F. M., and Leroy, L. W., Bull. Am. Assoc. Petrol. Geol., vol. 27, No. 10, 1943, pp. 1393-1395; condensed by V. S.

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7470. Miller, J. C. P. Tables for Converting Rectangular to Polar Coordinates. New York, Dover Publications, Price, 75 cents.

These tables are intended for use with a slide rule or computing machine. Only one set-up of the slide-rule or machine is necessary for each determination; no intermediate work needs to be recorded. The tabulation is made in increments of the argument of 0.001. A table for reducing angles to the first quadrant for angles from 0 to 9630 and from 0 to 224.6293 radians is included. The tables may be used for a transformation of harmonic constants in Fourier series expansions, for the magnitude and direction of a vector from rectangular components, for the modulus and phase of complex numbers when given in Cartesian form, etc. - V. S.

7471. National Oil Scouts and Landmen's Association. Oil and Gas Field Development in United States, Yearbook 1943. Austin, Tex., vol. 13, 1943, 789 pp. Price, $7.50.

This yearbook includes a review of geophysical exploration during 1942 in certain States and in the United States as a whole. The remaining information on geological work, land and leasing activities, wildcat exploration, oil and gas production, pipe lines, etc. is supplemented for this year by a comprehensive introduction and appendix presenting articles on various aspects of the oil industry. (A review is given by W.A. Ver Wiebe in the Bulletin of the American Association of Petroleum Geoligists, vol. 28, No. 1, 1944, pp. 127-128.) - V. S.

7472. National Research Council. Transactions of the American Geophysical Union, 24th Annual Meeting, April 23 and 24, 1943, Washington, D. C., parts 1-3. Washington, 1943-44; part 1 : 330 pp. part 2 : 783 pp.; part 3 : 99 pp. Total price $8.50.

The Transactions of the American Geophysical Union for the year 1943 are issued in three parts. Part 1 contains the proceedings of the General Assembly and of the Sections of Geodesy, Seismology, Meteorology, Terrestrial Magnetism and Electricity, Oceanography, Volcanology, and Tectonophysics. Many reports and papers of these Sections are of direct interest to exploration-geophysicists. Parts 2 and 3 contain the proceedings of the Section of Hydrology and the proceedings of the joint regional meeting of the Section of Hydrology and the Western Snow-Conference. Nonmembers wishing to purchase the Transactions should address orders, with checks payable to the American Geophysical Union, to General Secretary, American Geophysical Union, 5241 Broad Branch Road N. W., Washington 15, D. C., U. S. A. - V. S.

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7473. Singewald, Joseph T., Jr. Bibliography of Economic Geology of South America. Geol. Soc. America, New York, Special Paper 50, 1943, 159 pp.

This publication is a sequel to bibliography contained in the book of B. L. Miller and J. T. Singewald, Jr., The Mineral Deposits of South America, 1919. It adds 1,852 titles to the previous 1,060 titles. The countries covered are Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, the Guianas, Paraguay, Peru, Uruguay, and Venezuela. Since 1919 there has been a marked increase in the investigation of mineral deposits in Brazil, Argentina, Bolivia, and Colombia. On the other hand, there was a decline in Chile and Peru. - V. S.

7474. van Tuyl, F. M., and others. Review of Petroleum Geology in 1943. Colorado Sch. Mines Quarterly, Golden, Colo., vol. 39, No. 2, 1944, 127 pp. Price, $1.00.

This annual review is the second in a series inauguarated by the American Association of Petroleum Geologists. The series purports to inform the workers in the petroleum industry about the new developments and trends in geology, geophysics, and petroleum engineering. In the present review an effort is also made to predict both the short- and long-term trends in petroleum exploration in the light of the current situation and probable postwar developments. Directly dealing with geophysics in this volume are the following papers: (1) New Developments in training of geologists and geophysicists; (2) developments in geophysics; (3) progress in geochemistry and geobiology; and (4) trends in petroleum geology and geophysics. Related to geophysics are also papers on new petroliferous provinces in the United States, unsuspected geologic conditions, discovery of deeper pays, etc. An extensive bibliography of maps and literature is appended. - V. S.

10. PATENTS

7475. Well Surveying Device; R. G. Piety, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Delaware. U. S. Patent 2,333,883, issued November 9, 1943.

Apparatus for electrically logging a borehole comprising a source of electrical potential, an elongated electrode connected to one side of the source and extending into the borehole, a pair of coils adjacent one another and in flux linkage relation with the elongated electrode, a grounded electrode connected to the other side of the source, means for measuring the total current in the elongated electrode, and means for measuring current in the coils. - Claims allowed, 2.

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7476. Subsurface Prospecting; D. G. C. Hare, Houston, Tex., assignor to Texaco Development Corporation, New York, N. Y., a corporation of Delaware. U. S. Patent 2,334,262, issued November 16, 1943.

The method of investigating the formation surrounding a borehole having a mud sheath on the walls thereof which comprises lowering through said hole simultaneously two sources of highly penetrating particles, one of said sources being surrounded by a material capable of slowing down the particles emitted from the surrounded source so that their penetration will not exceed substantially the thickness of said mud sheath, following each of said sources with a device for detecting particles emitted from said sources and returned to the holes after being scattered in the material surrounding the hole, and observing the difference in the relative number of particles registered by said detecting devices at different depths in the hole as the sources and detecting devices are lowered or raised through the hole. - Claims allowed, 3.

7477. Geochemical Prospecting Method; Stephen A. Kiss, New York, N. Y., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,334,269, issued November 16, 1943.

In the method of geochemical prospecting for subsurface petroliferous deposits in which soil gas is recovered from the soil and analyzed for constituents indicative of the proximity of such deposits, the step preliminarily treating the soil with a water soluble organic wetting agent, whereupon such constituents not otherwise readily removed from the soil are freed therefrom for collection and analysis. - Claims allowed, 4.

7478. Determination of Magnetic and Electrical Anisotropy of Formation Core Samples; Lyle Dillon, San Gabriel, Calif., assignor to Union Oil Co. of California, Los Angeles, Calif., a corporation of California. U. S. Patent 2,334,393, issued November 16, 1943.

A method for determining the magnetic anisotropy of earth core samples comprising subjecting said core sample to the magnetic field from a high-frequency pulsating electric current, varying the angular position of said core sample with respect to said magnetic field and correlating the relative changes in the character of said current effected thereby with the varied angular positions of said core sample, and determining therefrom the axis of minimum and maximum magnetic permeability. - Claims allowed, 10.

7479. Seismic Surveying; R. L. Klotz, Jr., Hazleton, Pa., assignor to Hercules Powder Co., Wilmington, Del., a corporation of Delaware. U. S. Patent 2,334,414, issued November 16, 1943.

In the process of seismic surveying which comprises positioning an explosive charge in the lower portion of a borehole, firing said charge and recording seismic waves therefrom, the step of positioning a column

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of detonating explosive having a diameter less than one-half inch throughout a substantial length of the said borehole and detonating this column of detonating explosive approximately simultaneously with the detonation of the said explosive charge whereby connections between the explosive charge and the surface of the ground are destroyed. - Claims allowed, 11.

7480. Method and Apparatus for Investigating Earth Formations Traversed by Boreholes; Aimé Claudet, Mattoon, Ill., assignor, by mesne assignments, to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,334,475, issued November 16, 1943.

A method for investigating earth formations traversed by a borehole comprising the steps of directing radiant energy in the ultraviolet-infrared band of the spectrum to the formation in place at a given depth in the borehole and obtaining indications of the effects produced by the radiant energy impinging thereupon. - Claims allowed, 28.

7481. Method and Apparatus for Determining the Electrical Characteristics of Geological Formations Traversed by Drill Holes; J. J. Jakosky, Los Angeles, Calif., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,334,491, issued November 16, 1943.

A method for determining the character and thickness of the strata in a geological formation traversed by an uncased drill hole, which comprises: passing an electric current through the strata adjacent the drill hole in a direction along and substantially parallel to the bedding planes of the strata, while determining the relative values of said current and of the accompanying electrical potential between two spaced points within the path of such current flow at least one of which points is within the drill hole adjacent said strata; and repeating the steps of passing such current and determining said relative values, with the current flowing through strata at different depths. - Claims allowed, 25.

7482. Magnetic Surveying Apparatus; E. P. Harrison, Barkingside, England, assignor of one-third to Arthur J. Hughes, Chigwell Row, Essex, England, and one-third to Henry Hughes & Son, Ltd., London, England. U. S. Patent 2,335,117, issued November 23, 1943.

A magnetic surveying apparatus comprising balancing means having two arms including similar conductors of high permeability, a third arm including an adjustable impedance and a fourth arm including a fixed non-ferromagnetic resistance comprising two metal strips of substantially the same resistance at a given temperature and wound together inductively, the impedance temperature coefficient of the combined metal strips being substantially the same as the impedance temperature coefficient of each of said high permeability conductors. - Claims allowed, 4.

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7483. Method of Making Geophysical Explorations; L. F. Athy, Ponca City, Okla., and E. V. McCollum, Houston, Tex., assignors to Continental Oil Co., Ponca City, Okla., a corporation of Delaware. U. S. Patent 2,336,053, issued December 7, 1943.

A method of reflection seismic surveying for determining the velocity of travel of seismic waves from adjacent the surface of the earth through the earth to at least one reflecting stratum, including the steps of successively generating seismic waves at two separate sources spaced apart substantially as far as reflections can be recorded, receiving seismic waves generated at the first source after reflection from said reflecting stratum at seismometers located adjacent each of said seismic wave sources, receiving seismic waves generated at said second source after reflection from said reflecting stratum at seismometers located adjacent each of said seismic wave sources, measuring the time of travel of the seismic wave from the first source to the reflecting stratum and back to the seismometer located adjacent said first source, measuring the time of travel of a seismic wave from said second source to the reflecting stratum and back to the seismometer located adjacent said second source, averaging said times of travel, measuring the time of travel of a seismic wave from one of said seismic wave sources to the seismometer adjacent the other of said sources and determining the velocity of the travel of seismic waves from the travel times thus obtained. - Claims allowed, 41.

7484. Geochemical Prospecting; Leo Horvitz, Houston, Tex., assignor to E. E. Rosaire, Houston, Tex. U. S. Patent 2,336,176, issued December 7, 1943.

A method for treating a soil sample containing entrained or adsorbed normally gaseous hydrocarbons in conjunction with water for the recovery therefrom of a hydrocarbon-containing gas sample for analysis which comprises confining the soil sample in a closed system, subjecting the sample to evacuation and heating whereby entrained gases and moisture contained therein are evolved, condensing a substantial portion of the moisture contained in the evolved gas to thereby leave a residual gas for analysis which is drawn off from said system, and returning the condensate to the sample. - Claims allowed, 3.

7485. Apparatus for Seismic Prospecting; C. C. Stotz, San Pedro, Calif., U. S. Patent 2,336,198, issued December 7, 1943.

An apparatus for seismic prospecting comprising a microphone, an amplifier electrically connected to the microphone and adapted and arranged to amplify the sounds received by the microphone, a recording motor electrically connected to the amplifier, said recording motor including a movable coil, a stylus, means pivotally mounting said stylus, means connecting the stylus mount and the movable coil in the recording meter whereby movement of said coil is imparted to the stylus, a tape, means to pull said tape under the stylus at a regular and known speed, a

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polarized pilot relay having an armature coil, a transformer, one coil of said transformer being electrically connected to the armature coil, the other coil of said transformer being electrically connected to the amplifier, a variable resistance, said variable resistance being electrically connected between the polarized relay and the coil of the recording motor, a battery having its midpoint connected to the coil of the recording motor, and relay contacts providing electrical connection with either pole of the battery through said variable resistance, whereby movement of the recording motor coil is controlled. - Claims allowed, 3.

7486. Seismograph Amplitude Control; J. P. Woods, Houston, Tex., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware. U. S. Patent 2,336,206, issued December 7, 1943.

A control circuit for thermionic tube amplifiers used for seismic recording, said circuit comprising a control tube, means for passing a heating current through the filament of said tube, means for altering the intensity of said heating current substantially simultaneously with the beginnings of a seismic recording period, whereby the temperature of said filament and the output current of said tube are caused to vary between an initial and final value during said period of recording, and means for applying to said amplifier tubes a bias potential derived from said output current. - Claims allowed, 2.

7487. Geochemical Prospecting; Leo Horvitz, Houston, Tex., assignor to E. E. Rosaire, Houston, Tex. U. S. Patent 2,336,612, issued December 14, 1943.

A method of geochemical exploration for subterranean petroliferous deposits which comprises collecting samples of soil at spaced points in the area to be investigated at a depth several feet below the surface, said depth being sufficient to eliminate the effect of surface conditions, and subjecting the individual samples to an analysis for the determination of the content thereof of substances soluble in an inorganic acid whereby the contents so determined may be compared for the purpose of identifying anomalously high values thereof. - Claims allowed, 5.

7488. Geochemical Well Logging; Leo Horwitz, Houston, Tex., assignor to E. E. Rosaire, Houston, Tex. U. S. Patent 2,336,613, issued December 14, 1943.

The method of logging a well drilled for the production of a petroliferous material which comprises collecting samples at spaced intervals along a borehole, determining the total content of material soluble in an inorganic acid in each sample, the samples collected being sufficient in number to yield data showing the variation in total acid-soluble content with depth, and correlating the contents so determined with the depth of the samples, whereby such correlation may be interpreted to predict the possible approach to a petroleum deposit. - Claims allowed, 3.

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7489. Method and Apparatus for Perforating Well Casing by Gunfire; G. F. Turechek, Los Angeles, Calif., assignor to Lane-Wells, Co., Los Angeles, Calif., a corporation of Delaware. U. S. Patent 2,336,819, issued December 14, 1943.

The method of forming a light-weight glass bottle or other glass container which comprises forming a charge of glass into a hollow parison suitable for further expansion to the contour and size desired for the container, applying a chilling influence to a predetermined portion only of the parison to intensify the cooling of that portion as compared with the cooling of the adjacent portions of the parison, and then blowing said parison to form the container desired. - Claims allowed, 4.

7490. Gravity Meter; D. H. Clewell, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York. U. S. Patent 2,337,152, issued December 21, 1943.

A gravity-measuring device comprising a mass structure, means for pivotally mounting the mass structure for rotation in a vertical plane about an axis in substantially the same horizontal plane as the center of gravity of the mass structure, means for balancing the gravity moment of the mass structure which generates a torque r of such form that

$$\frac{dr}{d\theta} \ll mgr \; ; \quad \frac{d^2r}{d\theta^2} \cong - mgr \text{ (approximately)}$$

where mgr is the gravity moment of the mass structure and θ is the angle of rotation of the mass structure, and means for varying the effective lever arm through which the balancing means acts upon the mass structure to displace the mass structure an amount sufficient to nul the instrument. - Claims allowed, 8.

7491. Well Logging; L. W. Blau, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,337,442, issued December 21, 1943.

A device for logging a well, comprising, in combination, a container, two pairs of electrodes arranged on the exterior of said container, a large condenser arranged in said container, a cable for suspending said container containing at least four insulated electrical conductors, a source of direct current connected to the upper ends of a pair of said conductor cables, the lower end of one said pair being connected to one of said electrodes; and to one side of said condenser, a switch arranged in said container to selectively connect the other side of said condenser to the lower end of the other of said pair of conductors or to an electrode the other pair of cable conductors being in a circuit including the other two electrodes and a vacuum tube voltmeter. - Claims allowed, 1.

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7492. Process for Locating Valuable Subterranean Deposits; L. W. Blau, Houston, Tex., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,337,443, issued December 21, 1943.

A method for prospecting for oil which comprises, selecting samples of soil at laterally spaced points over an area to be investigated remote from the oil sought for and examining these samples under ultra violet light whereby the relative fluorescence of such samples may be correlated with sample locations to yield data useful in determining the location of the oil sought for. - Claims allowed, 1.

7493. Well Logging; J. J. Heigl, Tulsa, Okla., assignor to Standard Oil Development Co., a corporation of Delaware. U. S. Patent 2,337,465 issued December 21, 1943.

In a method for logging oil wells in which drilling mud discharged from the oil well is examined for oil shows, the steps which comprise mixing said mud with a solvent for petroleum oil which does not fluoresce under ultraviolet light and is not miscible with water, separating the solvents from the mixture whereby an extract is formed, passing ultraviolet light through the extract, and measuring the intensity of the fluorescent light emmited from the extract. - Claims allowed, 1.

7494. Well Surveying Instrument; H. G. Doll, Houston, Tex., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,338,028, issued December 28, 1943.

A well surveying instrument for use with a multiconductor cable comprising a casing adapted to be lowered into a borehole, a plurality of conductors extending through the casing, means in the casing for providing indications of the inclination of the borehole, means in the casing including a movable light sensitive record strip for obtaining a photographic record of said inclination indicating means, a motor in the casing and connected in series with one of said conductors for moving said record strip, a switch in the casing, having a contact member adapted to be actuated in accordance with the displacement of said record strip to engage either of two contacts selectively, said contact member and one of said contacts being connected in the circuit of another of said conductors, and electrical illuminating means in the casing connected to said other switch contact and to a third of said conductors. - Claims allowed, 7.

7495. Well Surveying Apparatus; H. G. Doll, Houston, Tex., assignor to Schlumberger Well Surveying Corporation, Houston, Tex., a corporation of Delaware. U. S. Patent 2,338,029, issued December 28, 1943.

In apparatus for obtaining indications of the inclination of a borehole, which apparatus includes a casing adapted to be lowered into a

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borehole, a movable record strip in the casing and an electrical motor for moving said record strip, the combination of a source of electrical energy at the surface, a circuit including a single conductor cable connected to said source and motor, first switching means at the surface for opening and closing said circuit, and second switching means in said casing and adapted to be actuated by the record strip after predetermined displacements thereof for connecting said motor in said circuit, when said first switching means is actuated to close said circuit, to give the record strip a predetermined displacement and for disconnecting said motor from the circuit after said displacement has taken place. - Claims allowed, 8.

7496. Geochemical Prospecting; Leo Horvitz, Houston, Tex. U. S. Patent 2,338,643, issued January 4, 1944.

A method for geochemical prospecting in which soil samples are collected and subjected individually to a treatment to liberate therefrom a gas sample which is analyzed for its hydrocarbon content, the step of treating each soil sample for the purpose of liberating a gas sample therefrom with an aqueous solution of an inorganic salt having an acid reaction and an inorganic acid. - Claims allowed, 6.

7497. Magnetic Well Logging; J. C. Arnold, Los Angeles, Calif., assignor to Lane-Wells Co., Los Angeles, Calif., a corporation of Delaware. U. S. Patent 2,338,991, issued January 11, 1944.

An apparatus for logging well bores, comprising: a housing adapted to be lowered into a well bore; highly permeable elements arranged longitudinally therein; coacting pole pieces associated with said permeable elements and defining therebetween a gap, the permeable elements and pole pieces being so arranged that the magnetic field embraced by said elements is concentrated across said gap; a magnetizable wire in said gap; means for moving the wire past the pole pieces; means for moving said housing along a well bore; and a device for correlating the movements of said means. - Claims allowed, 4.

7498. Radiological Method for Surveying Wells; M. M. Albertson, Houston, Tex., assignor to Shell Development Co., San Francisco, Calif., a corporation of Delaware. U. S. Patent 2,339,129, issued January 11, 1

A method of determining the permeability of the various strata penetrated by a borehole, comprising the steps of incorporating with the drilling fluid used in drilling the borehole a nonradioactive salt of a metal and a radioactive salt of the same metal, said salts being soluble in said fluid, the concentration of the second salt being extremely small as compared with that of the first salt, and subsequently using an electric method to determine the concentration of the radioactive salt along the borehole. - Claims allowed, 2.

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7499. Geochemical Prospecting; D. S. Rearden and E. G. Brewster, Los Angeles, and R. T. Sanderson, Sierra Madre, Calif., assignors to Stanolind Oil & Gas Co., Tulsa, Okla., a corporation of Delaware. U. S. Patent 2,339,651, issued January 18, 1944.

Apparatus for sorbing soil gas from a gas-collecting zone comprising a conduit made up in a plurality of separable sections, one terminal section of said conduit being adapted for disposition entirely within said zone and to collect the soil gases therefrom, means associated with the conduit for sealing the gas-collecting zone from the atmosphere when said terminal section is disposed in said zone, at least one of the sections of the conduit near said terminal section containing a solid soil gas purification reagent, one of the other sections, further removed from said terminal section, containing a sorbent for soil gas, means for separately maintaining the reagent and sorbent in their respective sections, and means disposed in said conduit for inducing positive flow of soil gas from said zone, through said terminal section, the solid soil gas purification agent, the sorbent for soil gases and to the atmosphere. - Claims allowed, 5.

7500. Apparatus for Recording Seismic Waves; M. D. McCarty, Dallas, Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York. U. S. Patent 2,340,272, issued January 25, 1944.

An electric seismograph comprising in combination, means for creating seismic waves in the earth at a point substantially below the surface, a conventional geophone spread, amplifiers for each of the geophones, and a multiple element recorder for recording signals generated by the geophones in the spread, an additional geophone located on the earth's surface directly above the point where the waves are created in the earth, means for recording signals generated by the last mentioned geophone on the same recorder element as signals from a geophone in the spread, means operable by an element of the blasting machine for rendering this geophone inoperative a predetermined time after the creation of the seismic waves but before seismic waves have been detected by the geophones in the spread whereby vertical wave velocity data as well as all of the data that is required from a single geophone spread when shot in one direction can be recorded on a single seismogram. - Claims allowed, 3.

7501. Method for Seismic Surveying; E. M. Shook and R. W. Olson, Dallas, Tex., assignors by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y., a corporation of New York. U. S. Patent 2,340,275, issued January 25, 1944.

A method of recording a plurality of seismic data on a single trace of a seismogram that comprises the steps of detonating an explosive charge in the earth's surface to create seismic waves, generating and recording on a trace of a seismogram a signal indicative of the instant of detonation, blocking additional signals that are generated in the

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detonating circuit from the recording instrument so that they will not be recorded as secondary breaks, detecting the first impulse of waves which have traveled vertically upward from the explosive charge, recording the first impulse on the same trace with the signal that is indicative of the instant of detonation, blocking signals, which are generated by the geophone subsequent to the first impulse, from the recorder, detecting waves which have traveled directly from the explosive charge to a geophone in a conventional spread, recording these detected waves and subsequent reflections on the same trace with the first two mentioned signals. Claims allowed, 3.

7502. Geological Exploration Apparatus; K. H. Evjen, assignor to Nordel Corporation, both of Houston, Tex., U.S.A. Canadian Patent 415,208, issued September 14, 1943.

The method of electrical prospecting which comprises passing a current having a predetermined frequency through the earth between two spaced points adjacent the surface of the earth, picking up the potential difference between two other points adjacent the earth's surface and lying within the field of influence of said earth current, deriving from said potential difference a measure of the electrical characteristics of the earth in the area under investigation and repeating the measurement at different selected frequencies below about 20 cycles per second to obtain a spectrum of the potential representing variations in characteristics of the earth's strata at various depths below the surface. - Claims allowed, 18.

7503. Geo-Electric and Seismic Apparatus. Theodor Zushlag, West Englewood N. J., U.S.A., assignor to Hans Lundberg, Ltd., Toronto, Ontario, Canada. Canadian Patent 418,420, issued February 15, 1944.

Apparatus for determining the amplitude ratio and phase difference of sine wave electromotive forces of the same frequency comprising a plurality of sources of electrical waves of the same frequency which may differ in amplitude and phase, a nonreactive resistance network constructed and arranged to measure amplitude and phase comprising a plurality of nonreactive electrical impedances connected in series, respectively, with said sources, a plurality of similar electrical amplifiers connected in circuit with said impedances, and an indicating device connected in bridge relationship with said amplifiers. - Claims allowed, 4.

7504. Electrical Exploration Apparatus; D. S. Muzzoy, Jr., and Robert Du Wayne Miller, both of Houston, Tex., U.S.A., assignors to Shell Development Company, San Francisco, Calif., U.S.A. Canadian Patent 418,747, issued February 29, 1944.

In a system of electrical exploration, a commutator circuit comprising arc discharge tubes, a source of direct current connected thereto, a source of controlled frequency voltage pulses connected thereto, grounded current

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electrodes connected thereto, means for discharging said tubes by applying thereto said voltage pulses, whereby the direction of the current flowing between the current electrodes is reversed, and indicating device, grounded potential electrodes connected to the terminals thereof, and relay means actuated by said voltage pulses for reversing said connections in synchronism with the reversals of the current flowing between the current electrodes. - Claims allowed, 6.

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